PANT and VARNISH Production

TECHNICAL MAGAZINE FOR MANUFACTURERS OF PAINT, VARNISH, LACQUER AND OTHER

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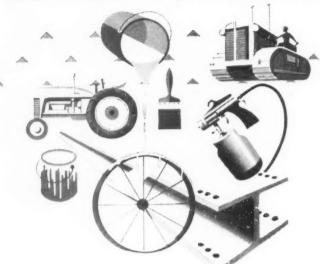
MARCH 1952



REICHH

1079 C.P. RCI CHROME YELLOW MEDIUM

"Makes All Previous Chrome Yellow Standards Obsolete." Widely Used for Such Exterior Uses as Vehicle and Implement Finishes, Bulletin and Trim Fnamels



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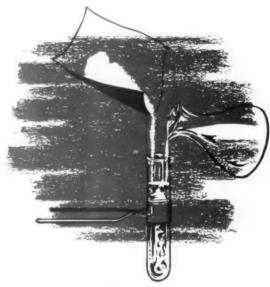
SYNTHETIC RESINS - CHEMICAL COLORS - PHENOLIC PLASTICS - PHENOL - GLYCERINE PHTHALIC ANHYDRIDE - MALEIC ANHYDRIDE - SODIUM SULFATE - SODIUM SULFITE



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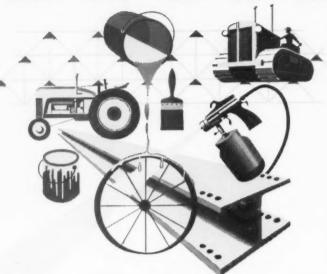
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NEXT ISSUE

Oil chemists have been intrigued by the potentialities of safflower oil as a drying oil in protective and organic coatings. In view of this interest, our next issue will carry an article on heat polymerization of safflower oil. Important factors as polymerization rates, effect of temperature and comparison with other drying oils will be covered and discussed.

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New York Senate Bill 1356

A N ACT to amend the penal law in relation to the sale of paints and enamels within the state of New York has been recently introduced in the New York State Senate. The bill proposes to amend the penal law by inserting therein a new section to read as follows:

After January 1, 1953, no person shall sell, offer or expose for sale within this state any paint or enamel and no person, firm, association or corporation shall send into this state for purposes of resale within this state any paint or enamel in any can, pail or other container which does not bear a label containing a true and complete statement of the ingredients and components of such paint or enamel and the percentage of each.

First of all we would like to ask the sponsors of such a bill what purpose, if any, would there be in revealing the composition of a particular paint to the consumer?

As far as the average consumer is concerned, he is not interested in the chemical composition and such an analysis would be helpful only to a paint chemist. The quality of paint does not necessarily depend on its chemical analysis, but upon the skill of grinding, mixing, and formulating appropriate materials to obtain a particular end product. The consumer is only interested in application and the performance properties of the paint product.

Is it the purpose of this amendment to inform the public of the presence of toxic materials in paints?

If such a listing were provided, we wonder how many would be able to distinguish which ingredients were toxic and which were not?

As a matter of fact, practically all ingredi-

ents used in paints, enamels, varnishes, etc. are toxic to a certain extent. However, if a particular product does contain lead or some other harmful material, it should be so indicated on the label.

From a production standpoint, this bill would impose some serious problems. Because of existing raw material shortages, paint manufacturers have developed flexibility in formulating techniques and from time to time have found it necessary to make substitutions in their various lines. Thus, everytime a formula is changed slightly, the manufacturer, in order to conform with the proposed bill, must change all his labels. This would entail an extra exspense which would ultimately be passed on to the consumer.

In a recent telegram to Hon. John D. Bennett, chairman of Senate Standing Committee on Codes, Frank R. Pitt, chairman of the Legislative Committee of the National Association emphasized three very important points which we feel are worth mentioning here:

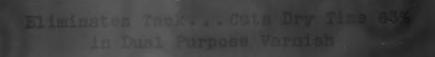
"This bill fails to recognize that industrial paint and finishes are made to the purchasers' specifications, and formula labeling would impose a needless burden upon such users having to pay the cost of individually printed labels even though such purchasers may have an interest in preserving the secret character of his industrial finish. Many large users including states, municipalities and public service corporations have paints formulated to their particular specifications and no useful purpose is served in labeling. The bill makes no provision for exemption of small packages and containers whereon it would be physically impossible to imprint the matter required.'

In view of the fact that this ill-conceived bill would impose great hardship on the members of the paint industry, we strongly oppose its passage and urge members of the paint industry to voice their opposition by immediately contacting the Senate Standing Committee on Codes, State House, Albany, N. Y.

Suggestions Pay Off

A MERICAN Cyanamid Company's Suggestion Plan completed its first year in operation with a record number of suggestions of 126 per 100.

Total awards to employees for the 5,342 suggestion that were adopted in 1951 totaled \$68,500. Of these, 40 were \$100 or higher. Altogether, 26,986 suggestions were submitted.



CASE HISTORY FROM THE NUODEX TECHNICAL SERVICE FILES

QUESTION: The following varnish is also used as an aluminum vehicle. 100 lbs. Modified Phenolic Resin; 10 gals. Oiticica and Tung Oils; 27 gals. Mineral Spirits; 1 lb. Nuodex Cobalt 6%. Dry times of our material and a competitor's are the same but our formula stays tacky. What drier adjustment do you recommend?

NUODEX ANSWER: Adding 41/2 ounces by weight Nuodex Manganese 6% eliminates after-tack and reduces drying time from 22.5 hours to

Our tests showed that the use of additional drier in this varnish solves the problem of tack and shortens drying time 14.25 hours or 63% measured by the RCI Recorder. Nuodex Manganese 6% was finally recommended because lead or calcium driers would affect leafing properties when the material was used as an aluminum vehicle. Although iron was also checked, it did little to improve the drying.

Here's another instance of how Nuodex technical facilities, reliable products, and knowledge of drier problems, assure customer satisfaction. So if you have a question about drying, mixing and milling, mildew or other subjects involving our additives, always ask Nuodex first.

NUODEX PRODUCTS CO., INC. Elizabeth F, New Jersey Nuodex Products of Canada, Ltd., Leaside, Ont.



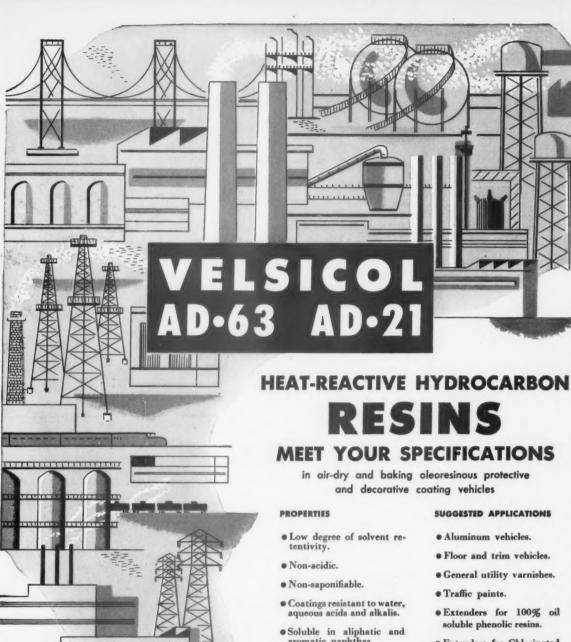


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For detailed information on the most effective use of "lead" in your paints... write to Lead Industries Association, 420 Lexington Avenue, New York 17.

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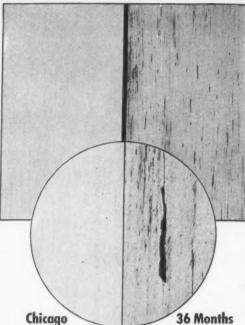
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It Strengthens . . . flexible, spiney lead soap particles mechanically reinforce the film and increase elastic strength.

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It Limits Oil Penetration . . . more of the vehicle remains in the film where it is needed; less is absorbed in the substrata.

It Improves Appearance . . . by controlling chalking and inhibiting mildew.



Pigmentation

31% White lead 30% Zinc Oxide

7% Rutile TiO₂

7% Anatase TiO₂ 25% Extender 36% Zinc Oxide 9% Rutile TiO₂ ref

ha

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ac

13% Anatase TiO₂ 42% Extender

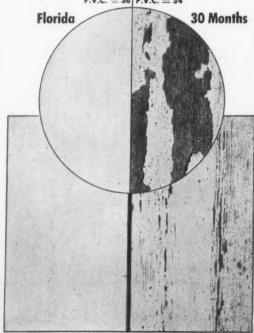
Self-Primed, south vertical, White Pine.

LEAD

NON-LEAD

Both formulations contain the same bodied oil type vehicle.

priors contain the same bodied oil type vehicle P.V.C. = 36 P.V.C. = 34





Age can't hurt this white any more than Johnny's dirty hands!

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acid content, high-baked enamel produced with this chemi-

cal in resin formulations has a final film that is permanently tough and flexible. Such enamels will not take on a dingy, yellowed appearance. Appliances will stay white for years and years.

Lauric fatty acid also finds use in the manufacture of plasticizers for nitro-cellulose lacquers.

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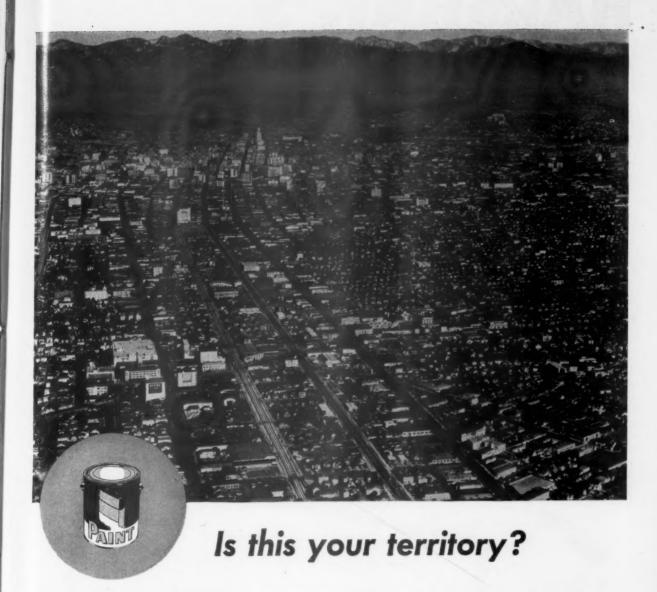
It also gives you these qualities most efficiently and economically.

Dutch Boy Basic Silicate White Lead "45 X" concentrates the reactive portion of each pigment particle at the surface. Thus proportionately larger amounts of "lead" are made available.

And you use fewer pounds of pigment, too. 60 to 63 weight units of Dutch Boy Basic Silicate White Lead "45 X" can replace 100 weight units of standard white lead types.

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And, if your business is in this area, you're probably also aware that there is a Canco plant in Los Angeles making a full line of containers for paint manufacturers—from putty and turp cans right down through to paint cans of all sizes.

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Color Stability of Clear Lacquers

By J. O. SMALL Hercules Powder Co.

HE COMMERCIAL importance of nearly water-white, color stable, non-pigmented nitrocellulose coatings has increased considerably throughout the past few years and current finishing trends indicate that the popularity of such finishes is becoming more wide spread. These finishes are to be found on blonde or bleached wood furniture and accessories, and as overcoatings for use over pastel colors or light colored metallic finishes.

Quite a number of methods have · been used in the industry to evaluate the color stability of these clear lacquer coatings and to appraise their all-around qualities. Since there are no well standardized test methods at present, some detail of the techniques employed in this study will be given in this paper.

Substrates

NE of the first questions involved the selection of a satisfactory substrate or base material upon which these clear films could be deposited, exposed to various light conditions, and then observed

This paper describes some of the preliminary work carried out in de-veloping test procedures for the evalu-ation of color stability in clear lacquer coatings and for studying the effect of resinous components in such While several of the cellulosics were included in this study, the portion described here is limited to nitrocellulose lacquers.

for color changes. The ideal substrate would be a white base having 100% luminous reflectance throughout the visible spectrum and not affected by exposure. Incidentally, it should not present problems of adhesion or migration

COLOR STABILITY OF UNFINISHED WOOD

Figure 1

White vitreous tiles were one of the first substrates investigated. The particular specimens examined were not as white initially as desired, the average reflectance throughout the visible spectrum being in the range of 83 to 85%. Some specimens were found to undergo a color change - vellowing — when exposed to a carbon arc. Because of these deficiencies. plus the problem of poor adhesion of lacquers to such surfaces, other base materials were investigated.

Since a considerable portion of such pale, color stable clear lacquers is used commercially on bleached or natural blonde wood surfaces, it was logical to consider these as base materials. They immediately proved unsatisfactory for quantitative measurements due to nonuniformity of the whiteness of different areas of the wood and because the wood itself yellows considerably under exposure. In addition, it is extremely difficult to measure film thickness. Figure 1 shows the discoloration of both un-

of constituents between coats.

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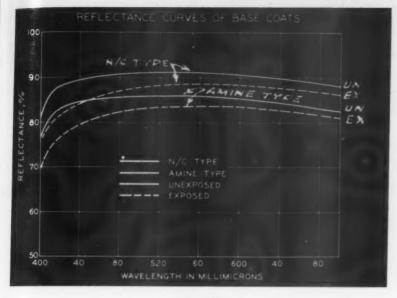


Figure 2

coated maple and bleached mahogany after ten days' exposure to sunlight.

Another base material investigated was a white alkyd-amine baking enamel applied to steel panels. In order to obtain maximum whiteness and hiding power, a formulation was used consisting of 70 parts anatase titanium dioxide, 21 parts amine formaldehyde resin and 9 parts of a very light colored lauric modified phthalic alkyd. The dried film sprayed on the steel panels was 1.5 mils thick. The finish was baked for 15 minutes at 250°F. General Electric spectrophotometer readings showed that its average luminous reflectance was only about 86% and that this value fell to about 83% after exposure to a carbon arc for 100 hours.

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A nitrocellulose-alkyd lacquer, pigmented white, was then examined. The formulation consisted of 40 parts anatase titanium dioxide, 20 parts RS 1/2" nitrocellulose and 40 parts of the pale colored lauric modified phthalic alkyd as used in the preceding example. An air-dried film of 1.5 mils thickness had initially an average luminous reflectance of 91%. After 100 hours carbon arc exposure, this reflectance had dropped only to 88%. This was the whitest, most color stable substrate found and it was used in most of the tests described herewith. Its reflectance characteristics, along with those of the alkyd-amine baking finish, are

shown graphically in Figure 2.

An interesting method of observing yellowing of clear lacquers is to apply the lacquer film over a pale blue base, and following exposure to observe the degree of greenish hue caused by viewing the blue base coat through a slightly yellow topcoat. The formulation of the blue lacquer base coat consisted of

22 parts anatase titanium dioxide 3 parts milori blue, 32 parts RS ½" nitrocellulose, 31 parts lauric modified phthalic alkyd and 12 parts dibutyl phthalate. In the present work, all clear lacquers were evaluated over the blue base as well as over the white base, but in general, the white base results were more satisfactory. Perhaps this was because the blue base absorbed more of the light and did not reflect it back through the film.

Application

A LL films were applied by spraying. The allowable thickness of these clear test films was 1 mil. plus or minus 0.1 mil. This tolerance was selected after it was found that the color changes in films varying in thickness by plus or minus 0.2 mil differed so little that they fell within the limits of experimental error. Wide variations in film thickness will naturally produce greater differences, but these can be eliminated from consideration where it is possible to measure film thickness. In this study, measurements were made with the General Electric magnetic film gage, and the thickness of the base coat was maintained at 1.5 mils plus or minus 0.1 mil. The thickness of

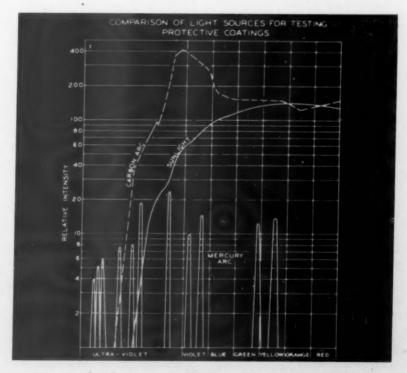


Figure 3

the topcoat was determined by the difference between the base coat thickness and that of the base coat plus topcoat.

Exposure

In the actual exposure of the clear lacquer films four series were used. These included two sunlight exposures at Wilmington, Delaware and Miami, Florida respectively, and two artificial light sources, namely a carbon arc and a mercury arc. All of these light sources are widely used in the industry in evaluating the color stability of protective coatings, but the results obtained from the different illuminants are not always easily correlated. Actually, the distribution of radiant energy throughout the spectrum is quite different for the three types of light sources as may be seen in Figure 3.

Here the relative intensities have been plotted against the wave length, and several interesting and important differences become apparent. First, the carbon arc, equipped with its filter globe, is a fairly good match for sunlight in the green, yellow, orange and red regions. Second, the carbon arc extends slightly farther into the ultraviolet region than does sunlight and is considerably more intense. The third point is that the mercury arc gives a discontinuous spectrum and has a high output in the shorter wave length region where there is no output whatever from either the carbon arc or sunlight. These curves indicate the relative intensity of the radiant energy falling upon a given area of the panel under the actual conditions used in those tests. Since the shorter wave lengths (ultraviolet) are known to be more destructive to organic films than the longer ones, it is apparent that color changes should be caused fastest by a mercury arc, next by the carbon arc and more gradually by sunlight. However, the difference in the quality of the light output of the three sources should be kept in mind in considering the results obtained, since the type of radiation encountered in commercial usage is most always different from that emitted by either the mercury arc or the carbon arc.



Fig. 4. Sphere used to record amount of incident sunlight while the panels were exsposed

Effect of Temperature

SINCE the exposure of a panel to any of the above mentioned light sources results in the film being heated to 100° to 130°F., a brief study was made of the color changes in films caused by such temperatures in the absence of light. Observations were made on masked portions of panels exposed to the carbon arc where the temperature is controlled at 125°F., and on panels placed in an oven at the same temperature (125°F.) for 100 hours. It was found that the color change occurring from the oven treatment, in the absence of light, was very small as compared with that resulting when the panel was exposed to light in addition to the 125°F. temperature. A continuous record of temperatures reached by the panels exposed to sunlight in Wilmington was obtained with a two-bulb recording thermometer. One bulb was coated with blue lacquer and the other with white lacquer, to match the panels under exposure. The highest temperature reached by the blue coated bulb was 101°F. and by the white bulb 93°F. The lowest temperature recorded during the test period was 41°F., and since this was at night, both bulbs recorded the same temperature. In view of the large daily and seasonal variations in sunlight intensity found in many areas it was considered desirable to record the amount of incident sunlight while the panels were exposed on the Wilmington test fence. This was done by means of an integrating sphere equipped with an opal glass window of known area, a photo-electric cell, and a recording electronic potentiometer. The sphere is shown along side the panels in Figure 4 which indicates the general arrangement of the test panels and recording equipment.

Complete statistics concerning the light conditions during this test have been recorded and show the number of foot candle hours for each 24 hour exposure period. The variation from the brightest day to the dullest day was 14 fold.

Expressing Results

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WO methods of expressing results were employed. The first, a visual estimation was satisfactory in most instances. It consisted of visually rating the exposed films, using zero for no change and 10 for the maximum change which, incidentally, occurred in the formulation based on high grade, pale, dewaxed dammar. The other method involved the determination, on the exposed portion of the panel, of the color, expressed as the dominant wave length, the degree of saturation expressed as the percent excitation purity, and the brightness expressed as percent luminous reflectance. Where a change in hue occurred, it was found that in all cases it was in the greenish-vellow region having a dominant wave length of 560 to 570 millimicrons. Consequently, the change in the appearance of any film can be characterized by a statement of the changes in purity and brightness.

Formulations

SINCE the prime objective of this program is to study the effect of various resins on the color stability of clear nitrocellulose lacquers, it was necessary to consider carefully the selection of a standard formulation in which the only variable would be the resin component. Some preliminary considerations were the viscosity grade of RS nitrocellulose to be employed and the use of a stabilizer. Films 1.5 mils in thickness consisting of 80% (dry basis) nitrocellulose and 20% dibutyl phthalate were applied over the standard white lacquer base coat and exposed to the car-

Figure 5

FORMULA OF CLEAR TEST LACQUER

LACQUER		PILM	SOLVERT
RS WITROCELLULOSE (1/2-SEC.)	7.9	36	
RESIN	11.9	54	
DIBUTTL PHINALATE	2.2.	10	
TOLURNE	39.0		50
BUTYL ACETATE	15.6		20
ETHYL ACETATE	7.8		10
BUTANOL	7.8		10
ETHANOL	7.8	_	10
	100.0	100	100

bon arc for 100 hours. The only variable was the nitrocellulose viscosity grade, the specific types included being 18 to 25 cp., 30 to 35 cp., 1/4 sec., 1/2 sec., and 5 to 6 sec. Very little change occurred in any case, and no relation could be observed between the viscosity grade and color change. Reporting upon the use of one stabilizer, namely phosphoric acid, films were tested both with and without the addition of 0.1% orthophosphoric acid based on the film solids. It was found that those containing that amount of this stabilizer consistently gave about 1% higher brightness values, both before and after 100 hours carbon arc exposure. No yellowing was present in either case. Following these observations, it was decided to use 1/2" RS nitrocellulose as the cellulosic film former and 0.1% phosphoric acid in the The complete formula is shown in Figure 5.

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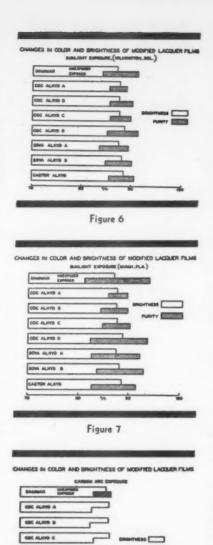
Resin used included the best grade of dewaxed pale dammar, several modifications of coconut alkyds, and both soya and nondrying castor alkyds. All lacquers were sprayed at approximately 22% nonvolatile, and the thickness of the dried film was 1 mil plus or minus 0.1 mil.

Five sets of panels were prepared, four of which were exposed under the following conditions:

- Exterior 45° South Wilmington, Delaware — 20 days
- 2. Exterior 45° South Miami, Florida 20 days
- 3. Carbon arc (Fadeometer)— 100 hours
- 4. Mercury arc (Uviarc-UA-3)

 4 hours

The fifth set, used as a control, was kept in the laboratory. The duration of each type of exposure was originally selected with the idea of obtaining about the same magnitude of visual change in each case. The results of the tests are shown graphically in Figures 6, 7, and 8. In these bar graphs, the yellow bars indicate the percent brightness and the red bars represent the percent excitation purity. In all cases, the upper bars show the characteristics of the unexposed films while the lower ones portray the conditions after expos-



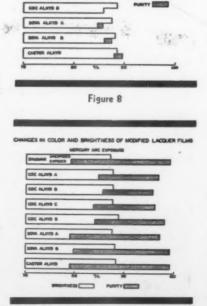


Figure 9

ure. Obviously, the most desirable resins are those whose lacquer films show the least loss of brightness and the least excitation purity after exposure.

Results

ATA on sunlight exposures in Wilmington are shown in Figure 6. The best panels in this series contained coconut type alkyds A, B, and C. After exposure, they had decreased about 2% in brightness and had developed excitation purities of 3.6 to 4.7%. This overall change is readily perceptible to the eye but would not be regarded as prominent. The panels representing the castor alkyd and soya alkyd B dropped a little more brightness (3%) and picked up more excitation purity (5 to 5.4%) and show a moderate visual change. The films containing dammar, coconut alkyd D and soya alkyd A exhibited considerable visual change. which would be inferred from the brightness loss of 3 to 4.5% and an increase in purity values of 5.9 to 7.1%.

The data on Florida exposures are plotted in Figure 7. As may be seen, the results parallel the Wilmington exposures, but the magnitude of change is somewhat greater. From these results it may be concluded that the best color stability under sunlight exposure is realized in a lacquer containing a carefully selected coconut type alkyd.

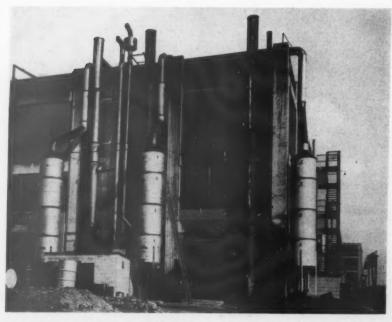
As may be seen in Figure 8, the color changes effected by a 100 hour exposure to the carbon arc were not as severe as by the 20 day sunlight exposure. Although the four coconut type alkyds underwent no measurable change in excitation purity, they all lost brightness to the extent of 2.8 to 3.5%. The castor alkyd, on the other hand, lost very little brightness, 0.6%, but it yellowed slightly, picking up an excitation purity of 1.8%. The two soya alkyds dropped 2.1 and 3.1% in brightness while gaining excitation purity values of 1.2 and 1.5%. Dammar was easily the worst resin in this series, losing 2.7% in brightness and gaining a purity of 4%.

The 4 hour exposure to the mercury arc brought about the most pronounced changes in the bright-

(Turn to Page 65)

Fume Control in the Varnish Industry

HE PROBLEM of removing vapors and odors from varnish cooking, cooling and allied operations has long concerned the plant managements of the industry. Where such plants are located in built-up residential or industrial areas, the pressure of public opinion and municipal authorities on the management has resulted in considerable study on the part of the industry and equipment manufacturers to determine the most effective and economical methods of removing such nuisance. The problem is particularly acute in those cities where because of their peculiar atmospheric conditions, pressure has been brought to bear on all industries to eliminate all possible sources of air pollution, even though the volume of emission from a paint or varnish plant might be minor compared with that of their neighbors. There is little, if any, evidence that the exhaust from varnish operating constitutes a health hazard in the neighborhood.



Three multi-wash units serving a total of eighteen fires in an east coast plant. Collectors are arranged for the recirculation of two liquids for eliminating nuisance odor in exhaust,

MANY devices for varnish fume control have been tried out and many thousands of dollars spent by the industry. The methods included condensers, spray chambers, steam chambers, dry baffles, wet baffles, bubble trays, Venturi Tubes with injection or sprays and incineration. Many of these methods are outlined in the National Paint, Varnish and Lacquer Association's Publication, Circular 703 dated February 1945.

One of the latest developments in this field consists of a special arrangement of a standard dust and fume collector offered by an equipment manufacturer having many years of experience in the foundry, chemical and process industries. This collector employs the principles of condensation, wet surface impingement, absorption and chemical reaction. The standard collector consists of a cylindrical column with the vapor and air inlet arranged tangentially in the lower section of the column.

Above the inlet are several stages of wet impingement elements, each consisting of a shelf plate, a ring of turbine-like vanes and a deflector plate. These elements are stationary and are so arranged that the contaminated air in its passage upward through the column is caused



Closed kettle installation. Note exhaust connection at rear. Barometric bleed-in not shown.

to rotate and change direction with sufficient velocity to break up the liquid which is supplied near the top of the column into the proper spray curtain patterns, achieving intensive scrubbing plus impingement against the vanes. No spray nozzles are used as the liquid enters the unit through a full sized pipe opening. An effective entrainment separator is built into the upper

section of the column. A standard fan is used to handle the proper air volume against the total resistance of the hoods, ductwork and collector.

For the handling of exhaust from varnish kettles, the collector is arranged for the recirculation of two or more liquids, which of course, are kept entirely separated. In the primary wash section a solution of alkali or solvent offered by a Chicago manufacturer is used. In the secondary wash sections, water, bisulphite solution, oil or other chemical additions are used dependent on the character of the materials being cooked.

Arrangement

THE general arrangement of collector with auxiliary equipment such as fans, recirculating tanks, pumps and kettle hoods is shown in the accompanying photographs.

A substantial number of these installations have been made in varnish plants of several of the prominent manufacturers of the industry. They are successfully removing nuisance odors from the exhaust from handling such materials as: alkyd resins (phthalic anhydrides), phenolic modified resins, ester gums, japan dryers, regular oils and varnish resins, bodied linseed oil, soy

(Turn to Page 44)



This photograph shows one type of hood with exhaust connections to the fume control system.



SUGGESTED METHODS FOR THE PAINT AND VARNISH INDUSTRY

By
CLARK C. THOMPSON
Foster Pump Works, Inc.

THERE is an age-old expression — "Fools rush in where Angels fear to tread," — and perhaps I am venturing far beyond my depth in addressing you gentlemen on the subject of Pumping Equipment in the Paint and Varnish Industry.

For, to be brutally frank, while I feel that I have the background which should and does enable me to talk intelligently on pumping equipment as a specific subject, — the application of that pumping equipment in a process industry with as many ramifications as your's possesses, bring up a real problem of specific prescriptions not found in any of the engineering, hydraulic or pump text or handbooks.

Viscosity Range

THE paint and varnish industry is probably one of, if not the most difficult wherein to suggest and advise satisfactory pumping

installations. Here one encounters materials with viscosities from water-thin up to Z-6 on the Gardner-Holt bubble viscometer. And specific gravities of from less than 1.0 up to six or seven times the weight of water. It is immediately apparent that the diversity of pumping problems in the paint and varnish industry are very great.

In many other fields of manufacturing endeavor one type of pump will efficiently and satisfactorily handle all of the pumping problems that may arise in those plants. In the paint and varnish industry it is impossible to honestly and correctly aver that any one single type of pump will be the most efficient and long-lived on every type of installation encountered therein. In some industries where the pumpage is of a constant and low viscosity, centrifugal pumps can be used entirely. In other types of manufacturing the density and thickness of their products make it imperative to install nothing but slow-speed rotary pumps. Still other plants, where process steam is a factor,

find steam-driven piston pumps an efficient pumping medium. But the paint and varnish industry is unable, by the very nature of its products and pumpable raw materials, to properly settle on any one single type of pumping machine.

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First, let us consider pumps that may be utilized in handling the liquid constituents that are used in varnish manufacturing. You are even more aware than I, that such liquids vary considerably in viscosity and, at various operations in your manufacturing processes, have a wide range of temperatures.

Taking up the basic oils — the body oil — we find the Tung oil dehydrated castor oil soy oil tall oil and the linseed oil etc. included. In processing conditions under average room temperatures, these oils may have viscosities from three or four thousand SSU, up to sixty or seventy thousand SSU; on the Gardner-Holt viscometer from "T" to "Z-6." Even the thinnest of these materials is of greater viscosity than could sensibly be recommended to be handled

Presented before the Vehicle Group of the New York Paint Varnish and Lacquer Association on Feb. 13, 1952.

by turbine or centrifugal pumps, whose efficient operation demands that the liquids be of viscosities lower than 750 SSU. Thus the pumps for these liquids should be positive displacement, either of the single or double-acting piston type, or of the rotary type. Because the initial costs and maintenance expenses are greater in the piston type pumps, your industry has generally settled on the rotary type pumps for this service.

It is most important that the proper size pump be installed, and that the pump operate at an efficient speed commensurate with the liquid handled. It is not practical or expedient to use the same pump installation or even duplicate pump installations for handling hot varnish and for pumping Tung oil at low temperatures.

Pipes

T this point may I diverge for Aa bit and talk about pipes just the plain black or wrought iron piping that you use to transport and transfer liquids around your plant. Oftentimes too small a diameter pipe is used. In no case would I recommend a smaller size pipe than 11/2" for handling varnish oils, and generally 2" should be the minimum, regardless of the capacity handled. Differing from other non-coating liquids, varnish oils either processed or unprocessed, when oxidized (and unless the pipes are continually filled, oxidization can take place) tend to deposit a thin film around the inside of the pipe. Continuous repetitions of



Interior of nickel pump. Everything but blades is made of nickel castings and machined parts.

this effect builds up on the inside of the pipe like the layers of an onion, and thus lessens the inside diameter. I have seen a 2½" diameter pipe, with a bit over twenty years service, so constructed that its actual inside diameter was less than ¾". Much of this oxidized inside coating of pipes can be prevented if thinners are circulated in cycles through them after the bodying oils have been passed through. In any event please remember to have as large diameter pipes as is economically possible.

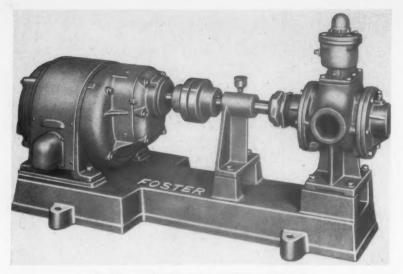
Pumping Speed
ETTING back to the pumps,
a good rule-of-thumb maxim

is that liquid should go through a pump no faster than at a 50% greater speed than the same bodied liquid will flow through a pipe. Say you had a pipe one-hundred ft. up in air and a tank on the upper end of that pipe. In the tank is Tung oil. You open the valve at the tank and allow the oil to run down the one-hundred feet of pipe. The temperature of the Tung oil is such that it takes one minute for the oil to first appear at the bottom outlet of the pipe. The flow of oil would then be 100 feet per minute. To handle this oil in any quantity it would be inadviseable to use a pump whose vanes, lobes or gears travelled at a peripheral speed of more than 150 feet per minute.

Thus, it is evident that the thicker and more viscuous the material, the larger the pump — operating at a slower speed — it will be necessary to use, to secure a given capacity. A certain size pump may deliver 100 gallons per minute of hot varnish with a viscosity of 2000-3500 SSU. But that same pump, if applied to the transference of a heavy oil of Z-3 to Z-6 viscosity should only be operated at a speed which would result in a capacity of from 40 to 60 gallons per minute. As the capacity of pumps theoretically varies directly with the speed, it is seen that a reduction of 40-60% in speed, is necessary when handling heavy,



Example of a gearmotor driven rotary pump equipped with vari-drive for filter press service.



Another example of a gear motor driven rotary pump.

viscous oils over that speed which may be utilized when pumping hot varnish.

In handling thinners no such problems of viscosity are encountered. As a matter of fact such liquids may generally be handled by centrifugal or turbine type pumps, where a flooded suction is available. In some cases it is necessary to "suck-up" the thinners to the pump, and for this certain types of self-priming centrifugal pumps can be had and, in many instances may be economically operated on such installations provided that the pump inlets and outlets are trapped so that the volatile liquid in the priming chamber will not evaporate. The rotary pump, having a positive displacement is not dependent on priming and can "suck-up" the liquid at any time.

Filter-Press Processes

THE clarification of varnish is produced by the centrifuge or by the filter-press processes or by a combination of both. Modern "speed-up" of varnish manufacturing processes tends to produce a superior product in a shorter elapsed time. Previously it was customary to "settle" the varnish for considerable periods so that most of the unwanted solids were removed before filtering. In those days the filter-press pumps which handled the varnish products would operate efficiently fpr long periods because of the lubricating nature of the pumpage. In today's processes, filter-aid expedites the clarification,

and must produce a more satisfactory product or you people wouldn't use it. However filter-aid, whatever it's form, is extremely abrasive, and it's action on filter-press pumping equipment is analogous to what would occur in the cylinders of your car's motor if you were to put a spoonful of emery powder in the tank every time you had it filled with gasoline. Varnish makers must reconcile themselves to more frequent repairs and replacement of filter press pumps, when filter-aid is employed as a clarifying agent. Steam driven piston pumps, because of their variable

speed and resulting variable capacity have been successfully employed in filter-press service. It is unwise to attempt to use a fixed capacity filter-press pump, because at the commencement of filtering with clear frames and practically no pressure required, a far larger capacity in gallons per minute can be clarified than is the case when the frames are loaded and pressures of from 50 to 60 lbs. are necessary to push the resulting filtrate through the press. However, satisfactory results can and have been obtained by the use of positive displacement rotary pumps, driven by variable speed gear-motors, and using shockabsorbing air chambers on the discharge line.

Types of Pumps

In the manufacture of paints, rotary pumps generally are found to be the most serviceable units. As with varnish, centrifugal pumps may be employed to handle thinners where the viscosities do not exceed 750 SSU. But, for handling the paints themselves, for the varnishes and the varnish oils and for the lead in oil and other bodying factors, rotary pumps are recommended.

Because of the high viscosity of the pastes used in paint making, it is extremely important that the pumps handling these products operate at a speed not greater than



Series of four rotary pumps equipped with built-in by-pass and relief valves driven by explosionproof gear motors. These units are installed at 20th Century Paint and Varnish Co. in Brooklyn.

the flow or drop of the paste into the pump. A pump that revolves too fast will receive and deliver the paste in "slugs," and not in an even flow. Besides, the wear and strain on a pump unit because of the unevennness of the pumpage under such conditions, will be in excess of normal. Lead in itself when combined with oil is a sort of lubricant and pumps on this kind of service seem to require less maintenance expense than do pumps that handle other types of solids used in the formulation of paints. It should ever be borne in mind that any piece of pumping machinery is a more or less precision instrument, accurately fitted; that anything in the product handled which will tend to impair or damage that accuracy will also shorten the economical life of that piece of pumping machinery. All pumping equipment is designed and constructed to operate satisfactorily even though somewhat worn by erosion or abrasion. But there is a certain point of wear-limit beyond which it is false economy to attempt to operate any pump. And the less lubricating, the more abrasive the material that the pump is called upon to handle, the shorter in actual time cycles is it's life of efficient service.

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In the lacquer industry, pumps are called upon to handle very light and volatile liquids. Because of it's displacement construction - it's "sucking" ability - rotary pumps are used in many instances to elevate these liquids, raising them up from underground tanks, and delivering the liquids to varying heights above the pump to the final destination. In the handling of these extremely volatile liquids some curious problems arose initially. I recall one instance where a rotary pump had been installed to handle what we considered a fairly high suction lift even for very thin bodied oils - the equivalent of some 27 to 29 Baume. But the pump had sucked the oils against this lift successfully, so our client attempted to do the same with lacquer solvent. The result was nothing pumped. In breaking open the pipe at the outlet side of the pump, a thick vapor was discharged therefrom when the pump was running. It was discovered that the pump actually was setting up a secondary

APPROXIMATE VISCOSITY CONVERSION TABLE

Gardner Holt	Seconds Saybolt Universal	Seconds Saybolt Furol	Engier Degrees	Engler Time	Barbey	Redwood 8't'd.	Redwood Admiralty	Kinematic Viscosity Poises at Sp. Gr. 1.0	Centistokes or Kinematic Viscosity Centipoises Sp. Gr. 1.0
	35	-	1.18	60	.2,800	32		026	2.6
	50		1.60	82	880	44		074	7.4
	75		2.30	102	460	65		141	14.1
	100	15	3.00	153	320	88		202	20.2
*******	150	19	4.40	230	205	128		318	31.8
A	200	23	5.90	305	148	170	18	431	43.1
n (250	28	7.60	375	118	212	23	543	54.3
B {	300	33	8.90	450	98	254	27	651	65.1
C	400	42	11.8	550	72	338	36	876	87.6
D	500	52	14.5	750	59	423	45	1.10	110
Е	600	61	17.5	900	48	518	53	1.32	132
F	700	71	20.6	1,050	41	592	62	1.54	154
G	800	81	23.0	1,200	36.5	677	71	1.76	176
н	900	91	27.0	1,300	32.0	762	78	1.98	198
J		100	29.0	1,500	29.5	846	87	2.20	220
M	1,500	150	42.0	2,300	19.5	1,270	135	3.30	330
D	2,000	200	59.0	3,000	14.5	1,695	175	4.40	440
0	2,500	250	73.0	3,750	11.5	2,120	230	5.50	550
11	3,000	300	87.0	4,500	9.6	2,540	260	6.60	660
v	4,000	400	117.0	6,000	7.4	3,380	350	8.80	880
V	5,000	500	145.0	7,500	6.0	4,230	435	11.0	1,100
W	6,000	600	175.0	9.000	5.2	5,080	530	13.2	1,320
Y	7,000	700	205.0	10,500	4.1	5,925	610	15.4	1,540
1	8,000	800	230.0	12,000	3.7	6,770	700	17.6	1,760
	9,000	900	260.0	13,500	3.2	7,620	780	19.8	1,990
Z-1		1,000	290.0	15,000	2.9	8,460	870	22.0	2,200
Z-3	10,000		590.0	30,000	1.4	16,920	1,760	44.0	4,400
	20,000	2,000	1,170.0	60,000		33,850	3,600	88.0	8,800
Z-5	40,000	4,000	1,750.0	90,000	******	50,800	5,300	132.0	13,200
Z-6	60,000	6,000	2,300.0	120,000		67,700	7,000	176.0	17,600
4	80,000	8,000		120,000		84,600	8,700	220.0	22,000
	100,000	10,000	2,900.0	300,000	*******	169,200	17,600	440.0	44,000
	200,000	20,000	5,900.0			338,500	36,000	880.0	88,000
	400,000	40,000	_11,700.0	600,000		508,000	53,000	_1,320	132,000
	600,000	60,000	_17,500.0	900,000		677,000	70,000	_1,760	176,000
	800,000	80,000	_23,000.0	1,200,000			87.000		220,000
	1,000,000	100,000	_29,000.0	1,500,000		846,000	01,000	-2,200	220,000

CENTIPOISES $\frac{\text{SSU}}{\text{K}} = .0022 \,\text{SU} - \frac{1.8}{\text{SU}}$ VISCOSITY IN CENTISTOKES = $\frac{\text{CENTIFY}}{\text{SPEC. GRAVITY}}$ ABSOLUTE VISCOSITY = K x 100 x Sp. Gr. ENGLER := .00147 E - 3.74 KINEMATIC VISCOSITY = ABSOLUTE VISCOS. SPECIFIC GRAVITY APPROXIMATE CONVERSION FORMULAE REDWOOD STD = .0026 Rw - 1.715 K = Kinematic Viscosity (Poises)
SU = Saybolt Time Seconds,
E = Engler Time Seconds,
Rw = Redwood Time Seconds.

form of vacuum distillation because of the high vacuum generated by the pump in attempting to meet the high suction lift conditions. Relocating the pump closer to the source of supply lessened the needed sucking ability to meet the lift. Likewise the vacuum created by the pump was lowered, and the solvent was able to be successfully handled. Thus we learned that, while a pump may possess the vacuum-creating ability to suck up liquids to it, the nature of those liquids and their volatility governs the actual suction lift possible to actual use.

To sum up some of these observations in a few brief sentences, may I suggest:

1. That the pipes used in handling Paint and Varnish Products be of as large a di-

ameter as possible - possibly 2" or greater.

SSU = Poises x 455 (Approx.)

- 2. That the pipe lines be exposed to as great an extent as possible. It's a costly and time-consuming job to locate and replace clogged underground pipe - particularly so if covered with a cement floor.
- 3. That specific information as to the nature of the liquid to be pumped be given to the supplier, when purchasing pumping equipment. There is a difference in the fitting of a pump which is to be used to handle oil at room temperature, and that on a pump to handle 600° F. varnish.

(Turn to Page 51)

Surface-Active Agents In Coatings

By
CHARLES GARDNER
Advance Solvents & Chemical Corp.
(Mgr. Field Sales, Eastern Div.)

Surface-Active agents are substances which are responsible for aiding wetting, emulsification, dispersion, foaming, levelling, anti-flooding, etc. These properties are interrelated and a given surface-active agent usually possesses all these properties to some extent. One function generally predominates over the others and thus forms the basis for the classification of the compound and for its selection and particular use.

The addition of small quantities of compounds other than the ordinary components of a paint to provide desirable working properties isn't a novelty for it extends back to the origins of the industry. Soaps, glues, egg white, natural gums, gilsonites, etc., were used. But, chemically synthesized surface-active agents for the paint industry were unknown, and from all evidence, apparently not even considered. As a matter of fact, their use in paints was, and still is, an offshoot of their development for the textile industry.

Synthetic surface-active agents first made their appearance during the Industrial Revolution when it became apparent that the soaps used as detergents by the textile industry were inefficient. They were unstable in acid solutions, and their calcium and magnesium salts

were insoluble. It was believed that these deficiencies were due to the presence of the carboxylic acid group. Actually the factors that made these soaps unsuitable as detergents are precisely those qualities which made them of interest to the protective coating industry.

The first really competitive synthetic surface-active agent was produced when other hydrophilic groups were introduced into the fatty acid chain, for example, the sulfonic acid group, – SO₃H in which the sulfur atom is attached directly to a carbon atom in the chain. Equally important were the sulfate ester groups –O'SO₃H in which the sulfur atom is linked to the carbon chain through an oxygen

atom. This first produce was the sulfated ester. Turkey Red Oil. prepared by sulfating castor oil. Its name was derived from the fact that it was used as an additive in dyeing of fabrics with Turkey Red. Turkey Red Oil was followed by many other "souble" or "sulfonated" oils prepared from a variety of natural fats; both vegetable and mineral. All these so called "sulfonated oils," contained only a small proportion of true sulfonic acids, their principal surface-active components being long chain sulfate esters.

Most Surface-active agents are salts which dissociate into cations and anions. Some are non-ionic. The position of the active part of the molecule determines the naming of the compound. If the active part is in the anionic portion, the agent is called anionic — if in the cationic portion, the agent is a cation-active agent.

The largest group of surfaceactive agents, is by far the anionactive group and for our purposes, the most important; this group can be subdivided into:

- 1. Soaps
 - (a) Alkali soaps
 - (b) Metallic soaps
- 2. Sulfated compounds
 - (a) Sulfated aliphatic esters
 - (b) Aliphatic sulfates (Sulfated Alcohols)

This is an abstract of the paper presented at the New York Paint and Varnish Production Club Meeting on Feb. 7, 1952.

- 3. Sulfonated compounds
 - (a) Aliphatic Sulfonates
 (b) Alkyl aryl sulfonates
 - (b) Alkyl aryl sulfonates sulfonates with alkyl side chains
- 4. Organic amine fatty acids soaps

Emulsions

As you will have noticed the emphasis up to now has been on aqueous solutions because that has been the pattern of historical development of surface-active agents. Their use as detergents was predicated on their ability to emulsify grease or other dirt and to suspend solid particles of dirt in water. The next natural step was to use these so called detergents as emulsifying agents for paint where both water and oil were used as vehicles. These emulsifiers not only helped prepare a homogeneous produce, but also served as stabilizers.

First among these emulsifying agents are the alkali soaps such as sodium oleate and sodium stearate. But they have the same serious defects as emulsifiers as they had as detergents, they are unstable in the presence of calcium and magnesism.

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More stable and less hydrophilic as emulsifiers are the amino compounds. Moreover, they are more soluble in non-aqueous solvents. Here again calcium and magnesium tolerance are poor. Morpholine and 2-amino-2 methyl-1-propanol (which is less volatile) have been found very effective. There are other amine types that have lower and higher boiling points than these two mentioned.

Just as castor oil, or any other oil can be sulfated so can any alcohol; i.e., adding S atom to the carbon atom through an oxygen link. The fatty acid chain falls within the same range as soap, i.e., C₁₈-C₁₈ and in fact, the sulfated alcohols function somewhat like soaps as O/W emulsifying agents. They are strongly hydrophilic but unlike soaps they are stable in neutral solutions. Typical are sodium lauryl sulfate and sodium oleyl sulfate.

The aliphatic sulfonates are among the best of the emulsifying agents. They are resistant to acids, alkalis, electrolytes, and have good calcium tolerance.

Non-Ionic

OF particular interest at this time, especially when we consider latex emulsion paints, are the non-ionic surface-active agents. These are the esters or ethers of fatty acids of 12 to 18 carbon atoms e.g., lauric, oleic, or stearic acid and various polyhydric alcohols or ethers such glycerol, sorbitol, pentaerythritol, carbitol, etc. The first patent issued on this type of surface-active agent was the French patent for the preparation of glycerol monostearates.

The non-ionic surface-active agents are independent of any degree of ionization of a polar group for attaining a suitable balance between hydrophilic and hydrophobic groups and are less affected by high concentrations. Since they will not dissociate in aqueous solutions they are completely calcium tolerant, i.e. they form no calcium salts at all. Moreover, they have a greater range of compatibility with ether solvents and chemicals than either the anionic or cationic active agents.

In a sense, practically everyone of the compounds previously mentioned as emulsifying agents, can function as a wetting, dispersing, flocculating, anti-sagging, or antiflooding agents.

Water dispersible agents function by giving an ionic charge to the pigment particles. When the pigment particles approach one another, an electrical repulsion force is set up between them which tends to keep them apart and prevents them from combining and settling to the bottom.

Cationic

A LTHOUGH there is a wide range of aqueous wetting agents available there is only a limited range of aqueous dispersing agents. These are all anionic and generally are all sodium salts or polymers of condensation products of aryl sulfonic acids with formaldehyde. Therefore, it follows that cationic dispersing agents should be better suited to the dispersing of pigments in aqueous solutions.

The cationic-active agents are few in number. The present most useful technically commercial compounds are the quaternary ammonium derivatives of which the most effective are trimethyl cetyl ammonium chloride, methyl cetyl pi-

peridinium chloride, and cetyl piridinium chloride.

Although these quaternary ammoniu compounds are nitrogen derivatives with a pentavalent nitrogen they should not be confused with other types such as morpholine fatty acid soaps which also contain a pentavalent nitrogen atom. Morpholin dissociates with the active groups in the anion while cetyl pyridinium chloride dissociates with the cation group as the active portion.

Typical examples of surfaceactive agents recommended for use in latex-emulsion paints is tetrasodium pyrophosphate to prevent flocculation and the sulfosuccinates to aid dispersion and stabilize the latex. On the other hand, thickeners and protective colloids are added in the form of proteins, celluloses, and gums.

When it comes to oil-resin systems there are very few synthetic surface-active agents either manufactured or recommended. Some agents such as Turkey Red Oil, and its modified forms, are soluble in both water and drying oils and are effective wetting agents in both types of media.

The majority of the aqueous wetting agents are insoluble in non-aqueous media while those effective in oil are insoluble in water. This incompatibility has naturally limited experimentation. On the other hand, despite this immiscibility, when the system is pigmented, the surface-active agents function as they should.

Another outstanding example of this double function are the above mentioned sulfo succinates which are probably the most powerful aqueous wetting agents known.

Other Types

SOME of the vehicles in which these tests were made included (1), a combination of 60% "Q" bodied linseed oil and 40% china wood oil. (2), a combination such as the first one to which some ester gum had been added; (3), various alkyds. This type of wetting agent has been found very effective with both hydrophobic and hydrophilic pigments such as barium lithol toners, lithopones, titanium dioxides, yellow iron oxide, carbon black, and iron blue.

(Turn to Page 50)



PRODUCTS & IMPROVEMENTS

A MONTHLY MARKET SURVEY



CHARLES ROSS & SON

Three Roller Mill. New Improvements

Model #52T 14" x 32" and 9" x 24" mills incorporates many improvements. According to the manufacturer, dispersion or particle size reduction is accomplished along the full production face of the rolls as new types of easily removed hoppers ride on the outside taper of the rolls. Latest type of thin wall roll construction and full length water cooling assures uniform grinding and temperature control. The three rolls revolve at specifically determined differential speeds and front roll speeds of 350 r.p.m. are used without excessive heating due to specially bored cooling chambers in the roll construction.

Other features include a specially designed balanced apron which assures uniform pressure of the thin take-off knife along the full face of the roll and eliminates scoring of roll ends; apron is quickly detached; "down-time" in cleaning is minimized by utilizing special bearings in the adjusting handwheels through which the rolls can be quickly disengaged; roll settings to any desired pressure can be obtained with calibrated indicating dials and is direct. - Charles Ross & Son Co., 148-156 Classon Ave., Brooklyn, N. Y. PVP— March.

STEARNILIDE

Acid Value

Wax Extender

Emery A-805-R is a hard, odorless waxy solid. Below, are typical characteristics:

3.0

Melting Point
Hardness (Shore
Durometer B)
Flash Point
Fire Point
Color, Solid

81°C
480°F
555°F
Light Tan

At higher temperatures, solubility in solvents increases and upon cooling, its ability to hold large quantities of solvent results in the formation of a gel.

Because of its wax-like character and compatability with other waxes, Stearanilide shows promise as a wax or wax extender for polishes, carbon paper, paper coatings, textile auxiliaries, etc.

Experimental samples and literature are available on request. Emery Industries, Inc., Dept. 5, Carew Tower, Cincinnati 2, Ohio. PVP—March.

ADDITIVE

For Industrial Finishes

Additive Raybo 43, renders industrial finishes virtually unscratchable according to the manufacturer. It is claimed that the use of this additive for baking finishes imparts a glass-like, mar-proof surface. Details are given in a technical bulletin, which will be sent on request. Raybo Chemical Co., 1120 Chester Ave., Cleveland, Ohio. PVP—March.

UREA RESIN

For Low Cost Enamels

The cost of white baking enamels for such applications as coatings for washing machines, kitchen cabinets, and industrial equipment may be lowered and stabilized by the use of Uformite F-158, a new urea formaldehyde resin. The resin is

based on propyl alcohol, which should be less subject to wide price fluctuations than the more widely used butanol.

Uformite F-158 compares very favorably with the company's long established Uformite F-200E. When employed as the amine component of white industrial baking enamels, it is reported to provide: Fast baking speed with good hardness, excellent gloss and gloss retention, excellent color and color retention, excellent stability, good adhesion, and high resistance to water.

While the mineral-thinner tolerance of the resin is somewhat lower than that of Uformite F-200E, it exhibits greater tolerance for xylol and toluol — conventional solvents for alkyds in enamels. It is suggested that Uformite F-158 be used as 10 to 40% of the total vehicle solids, depending upon film requirements. The balance of the vehicle may be either an oxidizing or non-oxidizing alkyd, such as Duraplex A-27 or Duraplex ND-77B. Rohm and Haas Co., Washington Sq., Philadelphia, Pa. PVP—March.

PETROLEUM RESIN

Varied Uses

Laboratory tests indicate that this particular resin can be used in asphalt tile, for sizing of Kraft paper, sealing compounds, adhesives, plasticizers, protective coatings and as an extender for rubber compounds.

Resin is dark colored and compatible with petroleum oils, asphalts, vegetable and fatty oils, oil soluble alkyd resins, and hydrocarbon resins. May be converted at high temperatures by air oxidation to a product similar to natural gilsonite. Recommended for application in products requiring resistance to water and solutions of acids, bases and salts. Asphalt Sales Section, The Atlantic Refining Co., 260 South Broad St., Philadelphia 1, Pa. PVP—March.

NEW PRODUCTS

VINYL COPOLYMERS Tailor-Made

Vinyl acetate copolymers in water emulsion form as well as in solvent solution, can be "tailored" to meet the particular needs of individual

The new water emulsions have a wide range of potential applications, including use in heat-seal coatings, grease-proof coatings, adhesive formulations, textile finishing, and binder for paper, fibers, cork, asbestos, and other mate-

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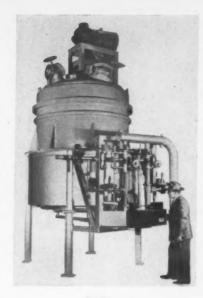
The bases can be supplied in a wide range of molecular weights and in concentrations ranging from low to unusually high solids content. They give adhesion to a variety of difficult surfaces. Complete details may be obtained from National Adhesives Division of National Starch Products, Inc., 270 Madison Avenue, New York City 16. PVP-March.

SYNTHETIC WAX High Melting

Acrawax C, a synthetic wax with the very high melting point 140°-142°C (280°-285°F) has been greatly improved in color stability toward heat, according to the manufacturer.

Acrawax C is a light tan, hard wax, which is supplied in atomized, powdered and coarse ground forms, as well as in the solid cast form. In many instances it is necessary to melt it, either alone or with other waxes, resins, etc. In the new improved grade, the darkening is definitely minimized. This factor is of special interest where color stability of the high melting point synthetic wax is important.

Acrawax C is used as an insulating wax; mold release agent; lubricant; detackifier; to increase moisture and salt-spray resistance; as a water repellant; anti-static agent; "stop-off" wax; etc. The industries using Acrawax C for these applications are plastic; rubber; electrical; paints and varnishes. Data and samples are available from the manufacturer, Glyco Products Co., Inc., Brooklyn 2, N. Y. PVP-March.



Brighton

RESIN KETTLE

With Special Features

A new feature of the water synthetic resin kettle provides for cooling the contents from a point immediately below the flange of the top head to within 18" of the bottom. Water is evenly distributed between the jacket, and the jacket is provided with an expansion joint. Cooling medium used is city water. This resin kettle has a 1000 gallon capacity, and is built entirely of solid stainless steel for operation under vacuum or pressures up to 40 psi. It is gas-fired but has every safety feature and advantage of Dowtherm. Special features of the kettle include: 1. push-button automatic pilot flame ignition; 2. push-button control that admits cooling air to temperature control when burners are shut off; 3. signal lights that indicate every stage of burner operation; 4. high sensitivity electronic controller that indicates as well as records; 5. choice of two-speed or variable-speed agitator drive.

If more information is desired concerning this kettle direct your inquiries to the Brighton Copper Works, Inc., 820 State Ave., Cincinnati 4, Ohio. PVP-March.

CHEMICALS

Resin Intermediates

Methylene-di-o-Cresotonic Acid, dibasic acid is suggested in

the production of specialty dyestuffs and resins for surface coatings and printing inks.

Dpentek Diformal is suggested

as a resin ingredient.

Both are available in research quantities and Heyden is interested in co-operating with any potential customers in developing significant market for them. Heyden Chemical Corp., 393 Seventh Ave., New York 1, N. Y. PVP-March.

FLAT WALL ALKYD

Dissolved in Low Odor Thinner

Pure alkyd flat wall vehicle free of rosin, rosin derivatives, lime and soaps and dissolved in a low odor solvent is marketed under the trade-name "Wallkyd." According to the manufacturer, this vehicle meets the demands of the paint industry in that paint formulators now have a vehicle which meets all their requirements. It is said that this vehicle combines the economy of limed vehicles with the speed of drying characteristics of emulsion paints.

Enamels formulated with this vehicle can be applied readily by roller or by 6 in. brush with no drag and retain their color in shades ranging from pastels to deeptones, on either sealed or unsealed surfaces. These wash readily without undue polishing or staining. May be used in combination with other alkyds for making high gloss enamels for interior trim and woodwork. Also used for sealers and undercoats. For further information on this vehicle write to Reichhold Chemicals, Inc., 630 Fifth Ave., New York 20, N. Y. PVP—

March.

ACRYLIC SOLUTIONS Thermoplastic Coatings

"Polycryls" are acrylic resin copolymerized in solvent solution. These include Polyacryl 413, 414, 415, 419, 420, 427. These are suitable for formulating transparent, high glossy, non-oxidizing, thermoplastic coatings. According to the manufacturer, these resin solutions feature good water, alcohol, alkali, acid and flame resistance. In addition, they have good electical properties and low pigment activity. American Polymer Corp., Peabody, Mass. PVP-March.



By Philip Heiberger

After ten years of varied industrial experience in the paint and related industries, I was fortunate to be able to resume my chemical studies at the University of Texas in Austin. I now find that, due to the impetus of World War II and the subsequent "cold war" research activities, progress in science has been advanced to such a degree that much of the subject matter in the chemistry courses taught today is markedly different from that of ten years ago. In my present full time struggle to regain a student's mastery of the "pre-1940" chemistry and to achieve a command of the newer "atomic age" chemistry, it has become apparent to me that active industrial chemists and chemical executives who attempt to keep abreast of developments are facing an almost hopeless task. So much data of importance to the paint industry is published each year that it is manifestly impossible for any individual to digest all of the current literature and still be actively engaged in his normal activities.

Desirable as it may be, it is hardly possible for every scientific worker in industry to take periodic "refresher" sabbaticals. Fortunately, there are many specialized trade journals and technical salesmen who perform an excellent service in keeping their respective segments of industry informed about developments in general and of saleable items in particular. Despite the many notable achievements accomplished by those who are not continuously at the forefront of science, there is always the danger that some remote academic development or technique of potential value to the paint industry will be overlooked. This is particularly true of analytical techniques that could be useful in evaluation, control and inspec-

In view of the above, this column will endeavor to perform a dual function: First, an effort will be made to bring to the attention of the readers such potentially valuable scientific developments as, for example, a notable piece of fundamental research, a new analytical method or a novel engineering technique which can be adapted to the paint industry. The second major function of this column will be to conduct forums on topics of fundamental interest preferably to be suggested by the readers. It is hoped that basic production and technical problems of general interest can be freely discussed by the editors, the readers and outside experts. Readers' comments and suggestions are invited.

IN THE November, 1951 issue of Nucleonics, a magazine devoted to developments in nuclear engineering, a review article by Jules Gueron entitled "Some Industrial Applications of Radio-elements Made at the Comissariat a l'Energie Atomique" contains a description of a rather interesting viscosimeter, as follows:

With the cooperation of Dr. R. Arditti of the French State Tobacco and Matches Factories, the Commissariat has developed a falling ball viscometer that employs radioactivity to detect passage of the ball. Application has been made for a French patent on this device.

This instrument is of interest for viscosity testing of opaque and very viscous liquids or pastes where the usual methods cannot be applied. In particular, electromagnetic detection of a metallic ball cannot be used where the falling speed is too low.

4 to 8 mc. of cobalt-60 is used either as a cobalt ball or as a diametral wire in a Lucite sphere (which may be convenient if a ball of small density is desired, or in corrosive liquids). Passage of the ball is recorded at two fixed levels, materialized by lead slits behind which can be placed halogen counters, small pressure ionization chambers, or any type of suitable detecting device. Slit widths and integrating

circuits can be adjusted as to make roughly equal the time necessary for the ball to pass across the slits and the time constant of the circuit.

The activated counter (or ionization chamber) triggers a circuit which can (1) flash a bulb, on which indication an operator operates a stop watch, (2) start or stop an electric stop watch, and (3) start or stop a 10,000 cycle oscillator and an electronic switch by which the pulses from the oscillator are recorded on a scale of 1,000. In its simplest form, such an apparatus can be made quite cheaply and it should be useful to laboratories or plants dealing with printing inks, dye pastes, match compositions, pitches and tars.

Items such as this appearing in the scientific journals led me to wonder how many of the readers are familiar with the above terminology and the usage of radioactivity in industrial practice. Although we are all acquainted with the military aspects of the atomic energy program and are also aware of some of the peacetime possibilities, it is not generally appreciated that one of the program's most important contributions has been the great increase in the variety, quantity and availability of isotopes suitable for experimental purposes. All fields of scientific inquiry are being profoundly influenced today by the almost miraculous abilities of the isotope tool. An understanding of recent developments, therefore, will soon be impossible without at least a superficial knowledge of isotopes and isotope techniques. Since the paint, resin, oil, pigment, solvent and chemical industries are no more immune to progress than any other field of scientific endeavor, let us see what radioisotopes can do for us.

To assist the paint and varnish chemist in what may very well be his first exploration into the field of radioisotopes, this month's column will begin a comprehensive review on the usage of radioactive isotopes in industry. It is believed that the background provided by this series will enable the reader to understand any discussion pertaining to the utilization of radioisotopes in chemical research. Even more important is the hope that some of the readers will be persuaded to study these techniques in greater detail for possible extension to their own research activities.

Radioactive Research

Although the use of isotopes as a scientific tool has been known for many years, it is only in the past few years that a large number of laboratories have had sufficient funds and properly trained personnel to conduct research with radioisotopes. Since the end of World War II a large variety of radioactive isotopes (manufactured at the various

atomic piles) became available in useful quantities. Because the isotopic method represents a relatively new and remarkably powerful tool for the solution of numerous problems in the various sciences, it has greatly facilitated the solution of many difficult and otherwise insoluble problems. A word of caution, however! Anyone planning to enter the field of tracer research should recognize the complexity of the field and first develop an "isotopic attitude." Only then should he attempt to review the blank spaces in his own field of specialization. He should realize that even the simplest tracer technique requires painstaking preparation because it is often necessary to develop new procedures for synthesis, isolation and measurements. It is not a field that one should plunge into recklessly with a minimum of preparation.

Because isotopes are elements having the same atomic numbers but different atomic weights, the fundamental principle which guides all tracer research is the valid assumption that the chemical properties of the isotopes of a given element are essentially identical. Although this assumption is essentially correct for the bulk of experiments, with the lighter isotopes, particularly the hydrogen series, differences do exist which must be taken into consideration. Because a radioisotope can be detected by its radioactivity, the characteristic property of the isotope, namely, its radio-activity, can act as a "tag" or label. Thus a series of chemical and physical changes can be followed in detail. The element which has been labeled or tagged is called a tracer element.

In practice, radioactive tracers are usually used in concentrations so small that the use of their emission properties is mandatory in analysis. Radioactive materials, as do x-rays, render gases conducting so that charged bodies would be discharged and the discharge rate could therefore be used as a measure of the intensity of the radiation. Radioactivity measuring instruments thus make use of the secondary effects of the radiation. Photographic or any ionization measuring instruments are equally suited to radioactivity measurements; the effectiveness of each method depends on the required sensitivity and the strength of the radioactive source.

Three different types of rays are known to be emitted by radioisotopes. The weakest, the alpha rays, are made up of particles of mass 4 bearing a positive charge of 2. They are much less penetrating than the beta rays, by a factor of about 100. The beta rays are high-velocity electrons, as demonstrated by their deviations in electric and magnetic fields, and the ratio of charge to mass. Their velocities range from 0.3 to 0.99 that of light. The gamma rays are extremely penetrating (about 100 times that of the beta rays) electromag-

netic radiations unaffected by either magnetic or electric fields. They are similar to x-rays but are much shorter in wave length.

Uses

Radioactive isotopes are used industrially in research and in process control. Much of this work deals with surfaces and thin films, where the quantities of material involved are extremely small and where, consequently, radioactive tracers offer a distinct advantage. For example, in studies on the mechanism of friction, steel piston rings are exposed to the action of neutrons in a nuclear reactor thereby becoming radioactive. The piston ring is fitted into the cylinder of an internal combustion engine which can then be operated, with suitable lubrication; in the ordinary way. By determining the radioactivity removed by the lubricating oil, the extent of wear of the piston ring can be studied. If a photographic film is placed against the walls of the cylinder, after running the engine, the radioactive material transferred from the piston can be detected by its "radioautograph;" in this way the areas of greatest wear are easily located. Improvements in lubricating oils and in the composition of sliding surfaces so as to reduce friction will undoubtedly result from such experiments.

Of great importance to the chemical industry is the subject of catalysis in all its manifestations. Radiocarbon-14 is being used to label hydrocarbons undergoing catalytic reactions; in particular, the Fischer-Tropsch synthesis is being investigated. This process involves the passage of a mixture of carbon monoxide and hydrogen over an iron catalyst to produce various solvents such as hydrocarbons and various oxygenated compounds. The importance of this reaction will have a profound influence upon the paint industry in the years to come. Wetting, detergency, adsorption and metallic corrosion are all examples of surface phenomena which are being investigated with the aid of radioactive tracers. Although activity in the paint and associated fields is relatively insignificant insofar as fundamental research is concerned, there are still several applications of borderline interest to the industry.

Over 280 isotopic forms of stable elements and about 40 radioactive isotopes exist in nature. In addition, several hundred synthetic isotopes have been made in recent years, so that at present there are more than a thousand forms of the 98 known elements. Oftentimes there is a choice of either a radioactive or a stable isotope. A consideration of the factors governing such a choice is in order at this juncture.

Advantages

Ease of detection constitutes the main advantage of radioisotopes, since virtually all the artificial radioisotopes used in tracer work are beta emitters. This tends, however, to prohibit lengthy observation because it implies a steady decrease in the amount of tracer. Before the discovery of carbon-14 with a half life of about 5360 years, the only known radioactive isotope of carbon was carbon-11, with a half life of 20.5 minutes. This means that an experiment employing carbon-11 must be completed within three and half hours after the creation of the carbon-11. This is a consequence of the working rule that the measurable life of a radioactive isotope is approximately ten times its half life. Frequently the nature of an experiment is such that many weeks must elapse before its completion. Such experiments require longer lived isotopes. Although it might seem from the above that the short lived radioisotopes have little value, the existence of an inverse relationship between the life of a radioisotope and the energy of the emitted beta particle must be considered. As a consequence of this relationship, a long lived isotope, such as carbon-14, may be difficult to detect if diluted too much. This fact will be elaborated in subsequent paragraphs.

Disadvantages

Aside from costs, the major disadvantage of using radioisotopes is the inherent danger of radiation injury. Damage can usually be avoided, however, by adoption of the various safety measures which have been devised. Isotopes which emit beta particles of low energy and no gamma rays, such as carbon-14, are particularly desirable because the protection they require is relatively simple. Moreover, for many industrial applications, really "hot" materials are rarely used.

In all events, adequate precautions are assured because the Atomic Energy Commission will not authorize the use of radioisotopes to any organization inadequately equipped for protection. A small lead shielded area to store the bulk isotopes between experiments is usually sufficient. In general, with the use of the minimum safety devices and reasonable care, the hazards are insignificant. A complete safety program is outside the scope of this discussion because each installation must be individually designed by competent authorities and approved by the Isotope Branch of the Atomic Energy Commission.

In such cases where suitable long lived radioisotopes are unavailable or the hazards are too great, the stable isotopes may be used. Their permanency and lack of physiological effect on living organisms make them invaluable, par-

(Turn to Page 61)

By Test the Best • High Density — Faster Dispersion Natural Shape — Minimum Wear Pure White — No Color Contamination • Smooth Surfaces — Easy Cleaning • High Strength — No Chipping or Cracking

40% MORE PAINT FROM YOUR PRESENT MILL!

by using COORS new



Grinding Media of High-**Density Alumina Ceramic**

Your present pebble mill capacity can be increased up to 40%, or more, merely by charging your mills with COORS Alumina Ceramic Grinding Media.

Leading paint manufacturers have proved this. One large plant even reports a 50% cut in mill time on flat wall paint! Another plant got a No. 6 fineness unobtainable in an overnight grind using conventional media.

COORS Alumina Ceramic Grinding Media is available as Balls (1" thru 3" dia.) or the new Natural Shape - developed specifically to speed pigment dispersion and minimize batch contamination in the paint industry.



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Please send information and samples of COORS Natural Shape Alumina Ceramic Grinding Media.

Send information on COORS Spherical Grinding Ball of Alumina Ceramic.

City & State







TENNESSEE EASTMAN PRODUCING CHEMICALS IN TEXAS

On the outskirts of Longview, Texas natural gas and propane started flowing into a maze of pipelines, furnaces, reactors, condensers and columns which are located on a 2400-acre plant site. This event climaxes a program initiated in Tennessee Eastman Company's research and development laboratories in Kingsport, Tennessee, some six years ago and represents a step toward selfsufficiency as far as the company's raw materials are concerned.

For many years Tennessee Eastman's principal raw materials have been cellulose and ethyl alcohol (Ethanol). Ethanol is converted to acetic acid, acetic anhydride, butyric acid and butyric anhydride. These acids and anhydrides, together with cellulose, are used in the manufacture of Eastman cellulose esters and other chemicals.

There were, of course, many factors which influenced the final decision resulting in Texas Eastman. Of these, however, two were uppermost in the minds of management. One had to do with ethanol itself — Tennessee Eastman's dependence upon ethanol; the



Propane is cracked in furnaces (rt.); propylene and ethylene separated in background.



Eastman's process is high pressure, catalytic reactors forming N- and iso-butyraldehyde.

unstable price of ethanol; and the potential shortage of this basic raw material. The second factor had to do with the long range outlook for butyric acid and for cellulose acetate butyrate and Tenite II which are dependent on butyric acid.

It was concern over butyric acid which set in motion the first development work in Kingsport. This work resulted in successfully combining a synthesis gas consisting of carbon monoxide and hydrogen with propylene under high pressure to form normal and iso butyraldehyde along the general principles of the German Oxo process.

Longview has an economical supply of natural gas and propane which are

starting materials in the production of propylene, carbon monoxide, and hydrogen for the modified Oxo process.

The production of n-butyraldehyde will be split three ways, a portion to be sold as the aldehyde, a portion shipped to Kingsport, Tennessee where it will be converted to alcohol and acid for use in manufacturing cellulose acetate butyrate and Tenite plastic, and a portion converted to 2-ethyl hexyl alcohol for use in manufacturing dioctyl phthalate in Kingsport.

The isobutyraldehyde production will also be split three ways, one part will be available to industry as the aldehyde, another part will be converted to the alcohol, and a part will be converted to the acetate. Tests made in substituting the isobutyl alcohol and acetate in lacquer formulation scurrently using the n-butyl solvents show great promise.

The ethyl alcohol produced in Texas will be shipped to Kingsport for conversion into acetic acid, acetic anhydride and solvents such as ethyl acetate and isopropyl acetate.

National Starch Building **New Research Laboratory**

A new research laboratory is being built by National Starch Products, Inc., to provide additional facilities for research on adhesives and resins, particularly vinyl acetate copolymers, which National has been making for some time for use in its own adhesive formulations and has recently begun supplying to

other users on a "custom-made" basis.

An eight acre tract adjoining its Plainfield-Dunellen plant has just been purchased for this purpose and by the time this goes to press construction should be started.

This represents a further step in the extensive expansion program on polymers and copolymers recently announced by Frank Greenwall, president.

Alkydol Names Morton-Myers Representative

Morton-Myers Company, located in Kansas City, Missouri, will handle Missouri, Kansas, Nebraska, Iowa, and Oklahoma, and will cover the paint, printing ink and allied industries in the sale of Alkydol alkyd resins and other synthetic resins.

Filo Color Named Agents Of Violite Pigments

Rhode Island Laboratories, Inc., West Warwick, R. I., manufacturers of Violite Phosphorescent and Fuorescent Pigments, announced that they have appointed Filo Color and Chemical Corporation, 202 East 44th Street, New York 17, N. Y., as their sales agents for Violite Pigments for the Paint, Ink and Paper Coating Industries.



Architect's rendering of the National Starch Products research laboratory to be erected on the newly purchased eight acre tract of land in Plainfield, N. J. Design is by Wigton-Abott.





Kenneth C. Towe

K. C. Towe Elected Pres. Of American Cyanamid Co.

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Mr. Kenneth C. Towe was elected President of American Cyanamid Company at a meeting of the Board of Directors on Tuesday, January 22nd. He succeeds the late Raymond C. Gaugler, who died suddenly on January 11th, 1952. Mr. Towe had been a Director of the Company since 1939.

The new President has been associated with the Cyanamid organization since April 26th, 1926 when he joined the Company as a member of the Accounting Department. He progressed through the positions of Assistant Treasurer and Comptroller and was appointed Treasurer on April 4th, 1939. On May 15th, 1945, Mr. Towe was promoted to Vice President in Charge of Finance, a position which he occupied until his election as President.

Woodman Again Heads Legal Aid Society

Herbert B. Woodman, President of the Interchemical Corporation, has for the fifth consecutive year accepted the chairmanship of the Chemicals and Paints Divisions of The Legal Aid Society's annual Fund Raising Campaign. Working with him will be Robert Bishop Fiske, Vice President and Director of American Cyanamid Company, who will serve as co-chairman of the Chemicals Division. The announcement was made by R. Gordon Wasson, Vice President of J. P. Morgan & Co., Inc., who is General Chairman of the 1952 Appeal.

Paint Div. of ACS Spring Program

The Division of Paint, Varnish and Plastics Chemistry of the ACS have announced the following program which is to be presented at the 121st National ACS Meeting in Milwaukee, March 30-April 3:

Monday Morning, Mar. 31 Auditorium, Englemann Hall General — Paint & Varnish Subdivision, Francis Scofield, presiding

Paper Chromatography of Polymethylol Phenols, J. H. Freeman Hydrogen Bonding in Phenolic Resin Intermediates, G. R. Sprengling Hydrogen Bonding in Phenolic Resin Intermediates, G. R. Sprengling Styrenated Epon Resin Esters, J. W. McNabb and Henry F. Payne Styrenated Esters of Bisphenol-Epichlorohydrin Condensates, R. W. Tess, R. H. Jakob, and T. F. Bradley

Correlation Between Properties of Alkyds and Composition of Modi-fying Fatty Acids. III. The Effect of Various Oil-Resin Ratios, D. T. Moore

Isophthalic Acid Application in Condensation Polymers, F. G. Lum and E. F. Carlston

Anticorrosive Primers. I. Study of Pigments and Vehicles Applicable to Magnesium, Allen L. Alexander, Roger Fericks, H. J. Segrave and J. E. Cowling.

Monday Afternoon, Mar. 31 Auditorium, Englemann Hall

Symposium on Evaluation of Test Methods and Analyses, Francis Scofield, presiding Introductory Remarks, Francis Sco-

Significance of Tests on Collapsible Tube Finishes, D. F. Menard Modification of the Atlas Twin-Arc Weather-Ometer, J. W. Tamblyn

weather-Onleter, J. W. Tambryn and G. M. Armstrong Extraction of Varnishes with Freon 12 and Freon 22, Harry B. Bolson Interpretive Analyses of Urea-For-maldehyde Resins, Peter P. Grad Autographic Apparatus for the Study of Thermal Distortion in Plastics, G. M. Armstrong and

W. D. Kennedy
Evaluation of Plasticizer Performance in Vinyl Resins, T. C. Patton

Tuesday Morning, April 1 Auditorium, Englemann Hall

General - Plastics Subdivision, A. K. Doolittle, presiding Chloromethyllation of Polystyrene,

G. D. Jones Polymerization of Radioactive Monomers, F. L. Ingley and A. F. Roche

Resin Forming Reactions of Furfural and Phenol, L. H. Brown Degree of Polymerization in Mela-mine-Formaldehyde Molded Res-ins, H. P. Wohnsiedler

Liquid Polymers of Acrylic Esters, C. E. Rehberg and J. Siciliano Oxidation of Polyethylene Resin, C. S. Myers

Tuesday Afternoon, April 1 Auditorium, Englemann Hall Printing Ink Subdivision, A. C. 7ettlemoyer, presiding

Loss of Drying on Aging. Properties of Hydrate Lakes, D.M.Nace and W. C. Walker
Rheology of Printing Inks. II.
Studies of Simple Dispersions, A.
C. Zettlemoyer and G. W. Lower

Optical Characteristics and the Measurement of Surface Bronze, Daniel Smith

Important Nat'l. Lead Changes

The following appointments were announced by National Lead Company:

Karel Vettewinkel has been appointed assistant to the manager, linseed oil sales and white lead sales, for the company. Mr. Vettewinkel continues as manager of dry white lead sales, including basic silicate white lead "45X."

Casper Wickemeyer, Jr., has been appointed general superintendent of the Chicago Branch of the company, having under his jurisdiction the Southern and Raymond plants in Chicago, the American Lead plant in Indianapolis and the Northwestern metal plant at St. Louis Park, Minnesota.

Sharples Chemicals Combines With Pennsalt Mfg. Company

The combination of Sharples Chemicals Inc. with the Pennsylvania Salt Manufacturing Co. through an exchange of common stock has now been effected, George B. Beitzel, Pennsalt president, announced recently.

For the present, Mr. Beitzel said, Sharples will continue to operate as a separate unit of Pennsalt, with, however, an exchange of technical information and coordination of some policies to the mutual benefit of both organizations.

Dr. F. Conklin Named Mgr. of **Tennessee Eastman Company**

Dr. Fred R. Conklin has been named Works Manager of Tennessee Eastman Company, James C. White, president, announced recently. Herbert G. Stone, formerly vice president and works manager, will continue as vice president of the company.

Titanium Pigment Corp. Discontinues Allocations

Titanium Pigment Corporation, subsidiary of National Lead Company, has discontinued allocations of all types of titanium dioxide pigments, both pure and calcium base, and announces that it is now ready to accept additional orders for the pigments, which have been in short supply almost continuously since 1943. Plant expansion, underway since the end of World War II, has brought substantial increases in tonnages at National Lead's titanium plants in St. Louis and Sayreville, New Jersey, easing the tremendous rise in demand during and following the war.

Increased production has been brought about in spite of serious material shortages, especially sulphur, by conservation and economy measures in the plants.





Walter A. Henson

Henson of Dow Speaks On Latex Paints at Biloxi

Walter A. Henson, head of the paint section of Coatings Technical Service, The Dow Chemical Company, delivered a technical paper before the spring meeting of the Southern Federation of Paint and Varnish Production Clubs at Biloxi, Mississippi, March 6, 1952.

The paper, entitled "The Formulation of Latex Paints," was co-authored by Mr. Henson and Norman R. Peterson, manager of Coatings Technical Service. Supplemented by illustrative slides, the paper includes a discussion of the types of commercially available latexes for making paints, the mechanism of film formation of latex, test results illustrating the effects of several formula variables, and a brief resume of the economics of basic paint raw materials. In addition, a few forecasts are offered based on present trends in the paint industry and current development information.

Ratcliffe Elected V.P. Of National Lead Co.

George L. Ratcliffe was elected a vicepresident of National Lead Company recently. He has been a member of the board of directors since 1948.

Mr. Ratcliffe has been general manager of the Baroid Sales Division since company operations under that name were begun in 1939. Baroid moved from Los Angeles to a new headquarters building in Houston, Texas last year.

Reichhold Receives Certificate To Build Phenol Plant

Receipt of a necessity certificate providing \$1,475,000 for expansion of Reichhold Chemicals', Inc. phenol producing plant in Tuscaloosa, Ala., was announced by Henry H. Reichhold, Chairman of the Board of Directors. The certificate was issued by the Defense Production Administration.

Phenol is a raw material of strategic national importance. It has many uses in the manufacture of military as well as

civilian articles.

P. J. Ryan, Vice President in Charge of RCI's Southern Division with offices at Tuscaloosa, stated that plans for expansion have been waiting only for the DPA certificate. "Building on the present approved development has already begun and plans are being prepared for additional engineering research programs," he stated.

Reichhold Chemicals' Tuscaloosa plant also produces chemically precipitated colors, synthetic resins and other

chemicals.

1952 Paint Conventions

General Joseph F. Battley and Hiram P. Ball presidents of National Association and Federation respectively have announced that the 1952 Annual Conventions of the National Paint, Varnish and Lacquer Ass'n. and the Federation of Paint and Varnish Production Clubs will be held in Chicago with headquarters at the Palmer House. The dates of the annual convention of the National Association are Monday, Tuesday and Wednesday, Nov. 17, 18, and 19. The Federation will hold their convention on the following Thursday, Friday, and Saturday, Nov. 20, 21, and 22.

and 22.

The business session of the two associations and the Paint Industries' Show will be held at the Palmer House. The Paint Industries' Show will open Tuesday, Nov. 18 and will close Saturday, Nov. 22.

Naugatuck Research Changes

Four major organizational changes in the research and development department of Naugatuck Chemical Division, United States Rubber Company, have been announced by M. G. Shepard, general development manager.

Dr. C. D. McCleary, formerly manager of process development, has been named manager of basic research which comprises the organic research formerly handled by Dr. D. L. Schoene recently appointed manager of plastics development. He will supervise all of the divisions's basic chemical and physical research.

Dr. J. N. Judy, formerly manager of technical service laboratories, was appointed manager of process development to succeed Dr. McCleary. Dr. Judy will supervise process development and factory service work in connection with rubber chemicals, plastics, agricultural chemicals and other chemicals in the Naugatuck line.

C. G. Durbin was appointed manager of technical services laboratories and personnel relations succeeding Dr. Judy. Mr. Durbin will supervise laboratory work on quality control and other specialized technical services for the development, production and sales departments.

At the same time, Mr. Shepard announced the appointment of Ivan Mankowich as manager of reclaim development. Mr. Mankowich will supervise research and development work in connection with reclaimed rubber.

Du Pont Pigments Appointments

The appointment of Roy E. Troutman as sales manager for white pigments in the Du Pont Company's Pigments Department was announced recently. He moved up from his post of assistant sales manager, succeeding William R. Morpeth, who is continuing in an advisory capacity pending his retirement later in the year.

At the same time, three other changes in pigments sales were announced. Donald C. Booth, manager of the southwestern sales office at Houston, Texas, was appointed assistant manager of the southeastern sales office, Philadelphia. H. C. Ballard, a salesman in the Houston office, succeeds Mr. Booth. John W. Croft, a chemist in sales service at the Newark, N. J., pigments plant, succeeded Mr. Ballard as a salesman in the southwestern area, with headquarters in New Orleans.

Acheson Ind. Acquires Peerless Ink Co. of Phila.

Acheson Industries, Inc. has acquired the properties of the Peerless Printing Ink Company and the Synthetic Lacquer & Varnish Company, adjacent

plants in Philadelphia.

Future plans, it was stated, call for the expansion of Peerless Printing Ink Company under the guidance of Albert H. Gere, former President and now President of the new subsidiary. Peerless Printing Ink Company, founded in 1922, produces printing inks for Sunday newspaper color supplements, rotogravure inks for printing on paper and vinyl plastics, and dispersed carbon for carbon paper manufacturers. The two properties, which will be combined and operated as Peerless Printing Ink Company, were bought to permit the immediate expanion of activities in pigment dispersions, much in demand today with the growth of the plastics and surface coating industries.



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B. R. Hale

B. R. Hale Heads Products Finishing of A. C. Horn Co.

Mr. A. E. Horn, president of the A. C. Horn Company, Division of Sun Chemical Corporation, has announced the appointment of Mr. B. R. Hale as vice president in charge of Products Finishing.

For the past few years Mr. Hale has been actively engaged in the development of protective coatings and "handtailored" industrial finishes for wood and metal surfaces. Under Mr. Hale's direction the manufacturing, research and sales program of Horn Products Finishing will be greatly broadened.

American Can Co. Wins ECA Award

The Economic Cooperation Administration has awarded American Can Company, a leading manufacturer of metal and fiber containers, a Certificate of Cooperation for assistance in the ECA program designed to strengthen the free nations of the world against communism.

The citation was awarded to Canco "for furnishing technical assistance to the peoples of the Marshall Plan countries to aid them in maintaining individual liberty, free institutions and peace."

Canning experts and scientists from many foreign countries have toured the company's laboratories and plants throughout the country. Information on manufacturing techniques, research programs and production methods was given to the visitors to help them rebuild their war-torn industries into modern type plants.



Gold watch is presented to W. P. Werner, pres. of Pecora Paint, Philadelphia, noting 48 years of service, by William Bullock, chairman of board with Laurance Bowen, Jr., vice-president

Pecora Paint Company Celebrates 90th Year

The Pecora Paint Company, Inc., 4th Street & Sedgley Avenue, Philadelphia, Pa., celebrated its 90th Anniversary with a Testimonial Dinner honoring employees.

The Dinner was held on Tuesday, January 29 and all honored employees and their wives attended.

Gold, engraved pins were presented to Robert Roecker, H. Wesley Hibbert, Steven Mahnke, Raymond Dronsfield, Paul Liebers, and Dave Strobel, for service of 10 or more years.

Gold, engraved watches were presented to the following — Philip Miller, Sr., Margaret Gleason, H. Clifford Parris, William B. Bullock, Walter Strobel, Ernest Jordan, Horace Garton, August Eskuchen, Albert Kemmler, William P. Werner, Harry Gabel, and James Loughlin, for service of 25 years or more.

One of the outstanding presentations of the evening was to Mr. James Loughlin, with 50 years of service.

Whelan of Nuodex Reports On European Paint Industry

Returning, from a two months' trip to Europe, H. V. Whelan, president of Nuodex International, Inc., predicted that overall sales of the paint industry abroad may soon again reach peak figures equal to those of the first half of 1951

At the moment the industry is in a transitional stage. Trade sales during the latter half of 1951 fell off and military production was not sufficient to take up the slack. However, by spring Mr. Whelan feels full-scale military production will be underway and the backlog of supplies built up after the outbreak of the Korean war will have been somewhat depleted.

During his trip Mr. Whelan visited Nuodex branch factories in Italy and France and plants under Nuodex license in England and Holland. He also visited Nuodex sales agents in Denmark, Belgium, Switzerland and Germany.

"The regrowth of Western Europe's paint industry," reported Mr. Whelan, "has been remarkable since the war. The industry is gradually catching up on the improvements in formulation and production which occurred here during the war. Many of the European paint factories in Europe have re-equipped since the war. In general, sales have

been on a much larger scale than before the war.

"Research in the industry and in academic groups - especially in England - is going ahead. But both production and research are somewhat restricted by the raw materials available to the industry and by the shortage of trained scientists in the field. For instance, there has been a decided growth in the use of styrene butadiene paints in the United States. Since Europe, outside of Western Germany, does not have a synthetic rubber industry, paints of this type may not be widely used there for some years to come. Vinyl acetate emulsion types of paint are more commonly used abroad than in this country.

"Before the war Germany supplied a large part of the raw materials used by European industry. After the war, plants were started in other countries. Now that Germany is getting into production again, competition is very keen."

Witco Names Runcie Mgr.

Witco Chemical Company announces the appointment of Earl T. Runcie to the position of manager of the Purchasing Department for Continental Carbon Company, Continental Oil Black Company and Barnhart Hydrocarbon Corporation.

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C. M. Burris

E. H. Green

C. K. Williams Sales Exec. Appointments

C. K. Williams & Co., East St. Louis, Ill., announces two important executive appointments.

E. H. Green has been appointed to the newly created position of General Sales Manager of the company. He will continue to make his headquarters at Easton, Pa., where he has been Eastern Division Sales Manager the past two years. Clyde M. Burris, formerly in charge of the Cincinnati office of C. K. Williams & Co., has been appointed Central Division Sales Manager, with headquarters at East St. Louis.

Great Western Paint Exec. Appointments

Fred N. Redheffer, president and general manager of Great Western Paint Manufacturing Corporation, has announced the following changes in executive personnel of the company following a recent Board meeting.

William Russell has been appointed vice-president and assistant general manager. Robert Leeper has been promoted to the office of vice-president and treasurer, moving up from the position of office manager, which he has held since October 1, 1946. Gus Kropff has been elected to the office of vice-president and purchasing agent. Mr. Kropff has served as purchasing agent for Great Western for the past seven years.

Mr. Redheffer has also announced that Great Western is the Colorizer associate for the midwest.

Dagmar Chemical Appointments

Appointment of Donald F. Martin as general sales manager and Dr. Thor J. G. Lonning as director of research and manufacturing of the Dagmar Chemical Co., Inc., was announced by Charles F. Krebs, president. The 20-year-old Glenbrook, Conn., manufacturer of lacquers, thinners and nitrocellulose solutions, serve principally the furniture, metalworking and automotive industries.

Spring Diffraction School

North American Philips Company, Inc. will hold its twelfth X-ray Diffraction School at the company's plant, 750 South Fulton Avenue, Mount Vernon, N. Y. during the week beginning Monday, April 21 through Friday, April 25.

The sessions involve extensive classroom and laboratory work and ample opportunity is provided for participants to discuss their own problems and to become familiar with actual use of all types of equipment.

On Friday, the entire day is devoted to actual application problems and a group of guest speakers give details on methods which are currently playing important functions in industrial laboratories and plants.

Monroe Sander To Manufacture Hot Spray Lacquers

Development of hot spray lacquers in a wide variety of colors was announced by The Monroe Sander Corporation of Long Island City, manufacturers of industrial finishes.

Harold Tanney, vice president in charge of production, stated that his company has previously produced only clear hot spray lacquers, which reduce costs and speed up production for manufacturers of all types of furniture and other wood products. Because of those advantages, he said there have been in creasing demands for these finishes in colors which are made possible through new processes and special formulations of synthetic ingredients.



Flattens the Finish . . . With High Mill Room Savings

SYLOID 308 produces a lower gloss finish economically. Mill room savings are increased. Syloid mill bases can be made highly concentrated... with a very short grinding time. Less flatting agent is required... mill room capacity is often doubled. **SYLOID 308** is a finely-sized synthetic silica of extremely high purity produced under rigid production controls. Uniformity of product insures uniform results.

Realize new high standards in flatting efficiency...mill room economy ...film characteristics...use **SYLOID 308**. For further information or help on your specific problem...write Davison's Technical Service Dept.

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R. H. Marston, Jr.

Binney & Smith Ups Marston

It has been announced by Mr. J. M. Hamilton, Vice-President of Binney & Smith Co. that Roy H. Marston, Jr., has been appointed resident manager of the company's Akron office.

Glidden's Nubian Div. Occupies New Space

Nubian Industrial Division of the Glidden Company will move its executive, sales and accounting offices into the three-story McClosky Varnish Company building across the street from the present Nubian Division offices at 1856 North LeClaire Avenue, Chicago, early in 1952.

This was announced today by A. D. Duncan, vice president in charge of the Glidden Company's Paint and Varnish Division, who said the move is being made to take care of the rapidly expanding activities of the Nubian Division in the manufacture of industrial finishes.

The Nubian Division's sales and technical service offices will be situated on the first floor; executive, auditing and purchasing personnel will occupy the second, and the cost department the third.

McAdams Joins Consulting Firm

John P. McAdams who has for the last four years served as a Mechanical Engineer for the Munitions Board is now employed by the firm of Joseph Mazia, Consulting Engineers, Washington, D. C.

Du Pont Appointments

Matt Denning, manager of the Finishes Division of the Du Pont Company's Fabrics & Finishes Department, will retire because of ill health February 29, after more than 31 years with the company. He will be succeeded by John W. Nestor, assistant manager of the division since February, 1951.

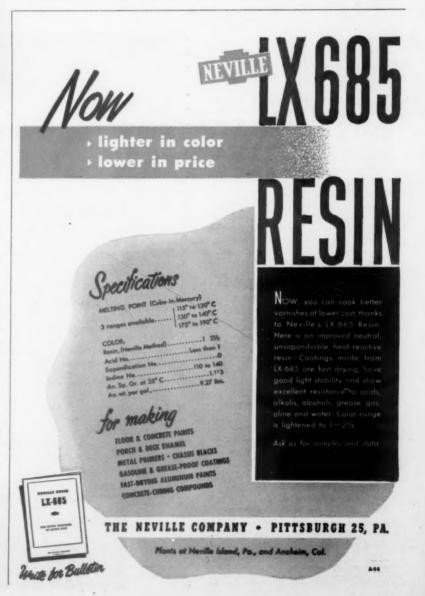
The company also announced that J. Raymond Buckley, manager of the department's Fabrics Division, will become manager of a newly created Personnel and Industrial Relations Division of the Fabrics & Finishes Department. Walter F. H. Mattlage, vice-president and director of production of Remington Arms Company, a Du Pont subsidiary, will succeed Mr. Buckley as manager of the Fabrics Division, with headquarters in New York.

Cabot Names Cleveland Agent

Godfrey L. Cabot, Inc., Boston, announces the appointment of Henry L. Grund Company, Cleveland, Ohio, as exclusive agents for the sale of Cabot carbon blacks to the paint, ink, plastics and related industries in the Cleveland and Northern Ohio area.

Naugatuck Opens S. West Branch

Naugatuck Chemical Division, United States Rubber Company, has opened a new southwestern branch office at Memphis for the sale of rubber and plastic latices used in paints, adhesives, industrial gloves, balloons, dolls, carpets, and the coating of paper and textiles.



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W. H. Mattil F. E. Tropp Falk Promotes Mattil and Tropp in Sales Departments

Appointment of Mr. W. Herbert Mattil as manager of Specialty Oil Sales and Mr. Frederick E. Tropp as manager of Technical Sales of Falk & Co. has been announced by Mr. Stanley D. Rogaliner, vice president and sales manager.

In his new position, Mr. Mattil will supervise the sales of all Falk & Company specialty oil products including limed oils, fractionated high iodine fish oils, esterified tall oils, oil additives for the petroleum industry, etc. Mr. Mattil is eminently qualified by his background of experience in the field to handle this new assignment having served for the past two years as a Falk & Company technical service representative.

Mr. Tropp in his capacity as Manager of Technical Sales, has been given the responsibility of supervising the sales promotion of all Falkyd Resins as well as Falk's entire line of caulking, glazing, and putty oils. Mr. Tropp has served as a Falk technical service representative for the past six years and prior to that time was an inspector and formulator of coatings and chemicals for the Technical Division of the U. S. Maritime Commission.

Hercules Powder To Produce Phenol

Plans for erection of an \$8,000,000 plant for the production of phenol, paracresol, and acetone by a unique new process were announced recently by Hercules Powder Company. With this step, the thirty-nine-year-old chemical company enters the field of chemicals produced by hydrocarbon oxidation.

Capacity of the new plant, which is scheduled for completion in 1953, has not been announced. However, it is understood that production of paracresol and cymene alcohols will be sufficient to care for expected increasing demands of industry; production of phenol and acetone will also be ap-

preciable. The processes are similar enough to permit much of the equipment to be used interchangeably; thus, capacity of each product can be increased if desired, while reducing the output of the other products in the processing cycle.

Capryl Alcohol Prices Reduces for Third Time

Sharp reductions in the price of capryl alcohol, the third such cut since mid-August, were announced recently by Rohm & Haas Co. The 95% grade was reduced to 15c per pound in tank car lots, f.o.b. Philadelphia. The former price was 201/4c. The 85% grade is now priced at 131/2c per pound, against a former price of 171/2c.

Capryl alcohol finds its principal use in the manufacture of ester-type plasticizers for vinyl resins. It is also used in the preparation of solvent-soluble urea-formaldehyde resins for coatings, as an anti-foaming agent, and as a low cost high boiling solvent.

Dr. G. Crume Elected Director of UCC

Dr. George O. Crume, Jr. has been elected a Director of Union Carbide and Carbon Corporation to succeed the late James A. Rafferty, Vice-President and Director, according to an announcement by Fred H. Haggerson, Chairman of the Board and President of the Corporation.

Dr. Curme, as vice-president, is in charge of all research activities of the Corporation. He has been a leader in the field of chemistry for many years, and is a pioneer in the chemistry of aliphatic compounds, now frequently referred to as petro-chemicals.

INTRODUCING

KETOSOL Solvents

"KETOSOL" 25

"KETOSOL" 75



miscible mixtures of

phenyl methyl carbinol

and

acetophenone



Low price ... in drums or tank cars ... pleasant odor ... high boiling.

Solvents for ...

gums sludges engine varnishes dyes adhesives coatings nitrocellulose vinyl resins alkyd resins

Also for use as . . .

reaction mediums
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intermediates for:
pharmaceuticals
dyes
components in:
perfumes
odor-masking agents

For information, write or call the nearest CARBIDE office, requesting data sheets F-7370 and F-6970.

*Approximate compositions.

"Ketosol" is a trade-mark of Union Carbide and Carbon Corporation.

CARBIDE AND CARBON CHEMICALS COMPANY

A Division of Union Carbide and Carbon Corporation 30 E. 42nd Street [1.4] New York 17, N. Y.

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Swelling of Paint Films

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Paint Div., April 18, 1951.

Paint films with vehicles consisting of drying oils such as linseed oil exhibit the property of water absorption and of swelling. The swelling capacity of a substance is based on the degree of affinity of its molecules for the swelling agent, and the degree of swelling depends on the size of its molecules, the degree of netting, the affinity of the swelling agent for the molecules of the swelling substance and on the degree of deformability of the molecule aggregates.

The swelling capacity of a substance can be influenced very strongly by other substances present in the mixtures of reaction, in the case of linoxyn by the substances soluble preferably in the hydrous as well as in the oil phase. Dr. Meier illustrated these conditions by referring to mixtures of two incompletely miscible liquid phases. The swollen film and its physical-chemical equilibria are compared with one of the two liquid phases. It is clear, for this reason that within the range of swelling equilibria both phases must exhibit identical vapor pressures. If a substance commences to swell, for instance in water, the vapor pressure after initial lowering rapidly increases until at the end large quantities of water must be absorbed in order to reduce the vapor pressure back to that of the hydrous phase. Another viewpoint is that if in the case of complete swelling of a substance a slight decrease of the vapor pressure by the value d p (d-p-vapor pressure), the degree of swelling is reduced very considerably. This principle was confirmed by the swelling curves obtained with linoxyn and mowilith in hydrous solutions of inorganic and organic compounds. It was found that swelling is strongly reduced with increasing amounts of additions to the hydrous phase so that with sufficiently high concentration the films did not show any weight increase at all. If on basis of the experimental data obtained the vapor pressure (p) is put in relation with the degree of swelling (i) we obtain a diagram expressed by the following formula:-

 $p = p_0 \cdot e^{-\frac{1}{4}}$

in which p_0 = the vapor pressure of the pure water and "a" = a constant.

We were also able to show that the process of limited swelling of films is reversible and that in the case of alkaline swelling by splitting of the esters and other bonds of linoxyn and by the for-

mation of soluable products limited may be transformed into unlimited swelling. Swelling may also be influenced by the film phase. Addition of paraffine to the oil phase may reduce the potential share of the swelling energy which is indicated by a decreased degree of swelling.

It is thus evident that the reversible swelling process exhibits a direct relation to the pressure of the vapor phase and that this phase can be influenced strongly by the addition of small quantities of dissolved substances.

Drying Inhibition of Linseed Oil

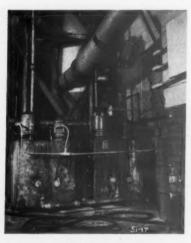
Meier, K. and Mebes, K. Presented before Eighth Technical General Meeting, Pigment and Paint Div., April 18, 1951. If a film of linseed oil without any dry-(Turn to Page 45)



This is an example of a removable for portable kettle. Hood bleed-in damper open thru part of the cook to prevent surface oxidation and discoloration. Note hinged side covers.



Typical installation of multi-wash collector equipment handling the exhaust from five open kettles in the plant of Chicago varnish maker.

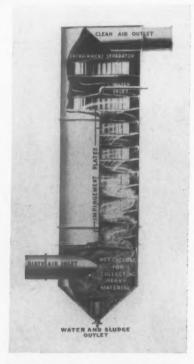


Twin-type: recirculating-tanks with vertical pumps for use with the dual liquid multi-wash collector. On some types of cooks, collected material can be salvaged from these twin tanks.

FUME CONTROL

(From Page 23)

bean oil, etc., tall oil esters and varnishes, and insitu varnishes (rosins, fatty acids). The method is effective for both open and closed kettle operation. For open kettles, suitable hoods are usually recommended to properly control and remove the vapors at the kettles. The collectors are manufactured in a complete range of sizes and selec-



Cut showing interior arrangement of stationary elements in the standard multi-wash collector.

tion is based on number of kettles served, size of kettles and hood arrangement. Systems are engineered to provide sufficient air at the hood or bleed-in at the closed kettle connection to dilute the fumes below the flash concentration. In some projects, duct system can be arranged with a separate connection from each kettle to the collector. This prevents a fire in one kettle from flashing to other kettles in the system.

The number of these installations now in service is indicative that the process is well beyond the experimental stage and the plant operators have been more than cooperative in their recommendations and test work on liquids for recirculation on various types of cooks. An initial installation in any plant is usually followed up by more units to complete the Company's odor control program.

Locations of these systems and further data may be obtained upon request to the Paint and Varnish Production publication.

Paint Sales To Be Figured in New Way

A new method of estimating monthly sales of paints, varnishes and lacquers has been adopted by the Bureau of Census to provide a more reliable picture of actual total sales of the industry. It is being adopted beginning with the January estimates of trade sales and industrial sales of these finishes.

In the future the statistical picture of the industry will be drawn from a scientific sampling method that is calculated to be within 2 or 3 percent of accuracy. A new panel of companies has been selected from which the figures will be gathered. The important feature of the new method is that the end result till be a total figure for the industry as compared with the previous surveys, which covered only a percentage of the industry.

Officials of the bureau, however, emphasized that the accuracy of the estimate arrived at through the scientific sampling method depends upon the accuracy of the reporting companies and the cooperation received from the industry. Because fewer reports will have to be tabulated, it was also thought that the monthly figures might be available earlier than heretofore.

The bureau has published statistics showing monthly sales of paints, varnishes and lacquers since January, 1928. From time to time the number and composition of the companies furnishing this information has been changed in order to reflect growth and development within the industry. The data from January, 1929, through December, 1951, are based on information from 680 establishments, selected from reports received in the 1939 Census of Manufacturing. These establishments accounted for about 90 percent of the total volume of the industry as reported in that census.

Data from the 1947 Census of Manufacturers, from the 1950 Annual Survey of Manufacturing and from the Bureau of Old Age and Survivors Insurance records of new companies were used to obtain an efficient sample for use in the new system of computing the industry's total sales.

Abstracts

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(From Page 43)

ing additions is exposed to the atmosphere it will dry by itself within 8 to 10 days, depending on the kind of weathering conditions and on the thickness of the film. This drying period can be retarded for weeks by the addition of aromatic amine and phenols. The authors determined the inhibition value of these organic compounds by means of the Lippert-Weger glass panel process. It was found that the inhibitory effect of the secondary aromatic amine exceeds that of the primary and tertiary amine and that the functions of the amino and phenol are additive. p-amino phenol therefore is one of the most effective inhibitors of linseed oil drying. Blocking of the phenolic hydroxyl group by etherification or esterification reduces the inhibitory effect considerably. Cyclic nitrogen bases, aromatic amino acids and acid amides exhibit little or no effect.

The oxygen diagrams obtained by the authors prove that within the first two days the weight increase amounts to 2-4 percent. The weight then remains constant or even decreases a little for a certain short or prolonged period until the weight-curves again rise up to their previous maxima. This behavior of the curves during the initial drying period indicates that as a primary reaction peroxides are formed while the inhibitory process represent a secondary reaction. Since the peroxides represent the activators of oxidation, and since they are destroyed by oxidation of the inhibitors, it is clear that absorption of oxygen is bound to be checked. The experimental work carried out by the two authors therefore indicated that 1) the effectiveness of the inhibitors is related to its normal redox-potential and 2) the inhibitor is changed by oxidation. Working with the system diphenylamine-linseed oil they proved that a. the diphenylamine is changed by oxidation and that b. it loses its nitrogen contents. Since the disappearance of the diphenylamine and that of the nitrogen does not occur at the same time it must be concluded that the difficulty volatile inhibitor molecule during the process of oxidation yields easily volatile nitrogenious products of decomposition which on account of their volatility evaporate from the film. The system phenollinseed oil clearly indicates the determining influence of the evaporation of the phenol.

The authors also studied the various ypes of inhibition. They found that the unsaponifiable matter isolated from linseed oil as well as Sitosterin and Tocopherol represent good inhibitors whose inhibitory effect can be eliminated by

the SHARPLES VAPORSEALcentrifuge the ONE machine for EVERY clarification or classification job

Running light carbon blacks, metallic oxides, clear goods? With the Sharples Vaporseal Centrifuge, you can selectively classify a wide range of pigmented goods . . . or completely clarify clear goods . . . a versatility made possible by exact, adjustable control over continuous centrifugal force 13,200 times gravity.

The full force applied to varnishes, clear lacquers, cold cuts and japans thoroughly and continuously removes foreign impurities... producing a consistently clear and brilliant

finished product.

On pigmented goods, by properly adjusting speed and through-put rate, you can select exact size of pigment to be left in suspension. All undesired pigment sizes and agglomerates will be automatically and effectively removed at the same time. The final high quality goods can be packaged right from the centrifuge.

And because cleaning the simple 4-part bowl of the Sharples Vaporseal takes just minutes, you can switch from color to color, color

to clear, easily and quickly. It will pay you to get the full details.



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acetylation. They were able by acetylating raw linseed oil to considerably reduce the drying period of the films. This finding may prove a satisfactory practical method for paint manufacturers to obtain still shorter drying periods without adding to much siccative for this purpose.

Catalytically Conjugated Linseed Oil

von Mikusch, J. D. Presented before Eighth General Meeting, Pigment and Paint Div., April 18, 1951.

For 25 years numerous attempts have been made to provide oils containing linolic and linolenic acids, such as linseed oil and soya oil with the valuable properties of wood oil by shifting the double bonds into the conjugated position. Conjugation effected in this man-

ner would insure the valuable properties of wood oil (more rapid drying, weather, water and alkali-resistance, etc.) without the typical disadvantages of wood oils. The index numbers of conjugated linseed oil (with the exception of the dienenumber and paradiene-number, which are evidence of conjugation) remain similar to those of the common varnish linseed oils. 80% of the multiple unsaturated fatty acids of linseed oil are catalytically conjugated, which corresponds to a percentage of 50 percent of conjugation. Dr. von Mikusch demonstrated that at first the conjugated linseed oil of this type exhibits a darker coloration than the original oil and separated solid glyceride which after short heating (initial stages of stand oil formation) is redissolved without reprecipitation, the color of the oil be-

coming lighter again. A conjugated linseed oil naturally reacts more easily and quickly than non-conjugated oil. For instance, it gelatinizes completely after 3 hours at 300 degrees Centigrade (570° Fahrenheit), the gel produced being much tougher than the well-known wood oil gelatine. The same applies to stand oil formation, the degree of viscosity of stand oil obtained on heating for two hours at 275 degrees Centigrade (525°F.) being the same as that obtained with ordinary linseed oil by heating for 14 hours at a temperature of 290 degrees Centigrade (550°F). It is remarkable that not all conjugations are used up, but that 50 percent are retained which is of considerable importance to the technical properties of the product. Conjugated linseed oil also dries much more rapidly, while if applied without siccative the film develops crackling effects. Most common siccatives are satisfactory although manganese compounds must be used with care. Since the film formation of conjugated linseed oil requires less oxygen it is not as "swellable" and since its compatibility for zinc white is very pronounced it will become a very valuable material for the painter - as soon as the above-mentioned disadvantage, the separation of solid glycerides. has been eliminated. Conjugated linseed oils tend to yellow somewhat, although not nearly as readily and strongly as non-conjugated oils.

Cataphoresis of Pigments in Paints and Varnishes

Meier, K. and Ladeburg, H. Presented before Eighth Technical General Meeting, Pigment and Paint Div., April 18, 1951.

Acting on the theory that conglomeration and settling of pigments in paints and varnishes may possibly be induced by electric phenomena at these bodies, the authors studied the behavior of various pigments and vehicles in an electric high-tension field. The observations were conducted with the aid of an ultramicroscope of the Siedentopf-Szigmondy type provided with an ocular micrometer for measuring the traveling speed of the pigments. The pigment suspensions were located within a microchamber, whose side walls were formed by the electrodes themselves and which at a distance of less than 1 millimeter were still within the range of vision of the microscope. The current was obtained from an electric generator supplying up to 1200 volts of direct current. On account of the small distance between the electrodes it was possible to obtain field intensities of up to 50 kV. cm⁻¹. It was possible by this method to measure not only the kind of separation (settling) of the pigment particles but also their traveling speeds at the same degree of

It was found that the traveling speeds



of the pigment particles grow linear with the field intensity only with low intensities and that the following types of behavior of the pigments were discerni-

 Straight-lined movement in the direction on one of the electrodes and separation (lithopone-linseed oil).

Whirling motion in the direction of one electrode, with only modest separation or increase of concentration (heavy spar-linseed oil).

 Chain formation starting from both electrodes in the case of pigments of metallic or similar behavior (aluminum, copper, graphite, lampblack, iron mica).

 Pendulating movement of the pigment particles between the electrodes (titanium dioxide in paraf-

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Series of investigations with different pigments and different vehicles indicated that in oils and synthetic resins (with the exception of nitrocellulose) all pigments investigated (titanium dioxide, zinc oxide, zinc sulphide, lithopone, white lead, barium sulphate, heavy spar, cadmium sulphide, iron (III) oxide, milori-blue, red lead and lead chromate) moved toward the anode. In nitrocellulose solutions the pigments of metallic or similar character moved toward the cathode, while the others exhibited a weak anodic tendency. While additions of organic solvents do not show any important variations, water either increases or reduces the traveling speed of pigment particles under the conditions selected. For instance in the case of barium sulphate it was possible to induce a change of the direction of travel by the addition of water. Basic or acid changes of the surface of barium sulphate also induce reversal of the direction of travel. Pigments with opposite charges pass one another on their way to the two different electrodes and settle out separately.

Determination of Phthalic Anhydride in Glyptals

Schkoljman, J. and Popowa, I. A. Russian Journal of Applied Chemistry, 22 (1949), 135-144.

The methods of determination of the free phthalic acid in glyptal resins known at present are based on a watery extraction of the resin or its solution. This process requires too much time (21/2) hours), besides being unreliable on account of the possible destruction of the acid ester and the di-ester of the phthalic acid. The authors therefore recommend the determination of phthalic acid by double titration, one titration of the unchanged resin, the second titration of the resin previously partly esterified with methyl alcohol. In order to test all stages of production of glyptal resins by this method of determination, i.e., the pure glyptal resin of short or

long boiling treatment or the modified resin, the following specification of test must be observed:—

2 to 4 grams of resin are weighed out and dissolved in purified acetone free of water. The solution is transferred into a 100 cc graduated flask which is then filled up to the mark with acetone. 10 cc each of this solution are then transferred into four different graduated flasks of 150 to 200 cc and 10 cc of acetone added to each flask.

20 cc of distilled water are now added to two of these flasks which are then connected with a reflux condenser and heated to 50-60° Centigrade on a water bath for ten minutes, the resulting solution being titrated with 1/10 normal hydrous solution of potassium or sodium hydrate. The contents of the other two

flasks are titrated with an alcoholic sodium hydrate solution directly or after previous methylation.

The calculation of the free phthalic acid anhydride contents in percent (x) is effected by the following formula:—

$$X = \frac{200}{a} \left(KT - K_1 T_1 \right)$$

K and K₁ are the consumption of hydrous and alcoholic solution in cc, T and T₁ are the corresponding titration standard and "a" the amount of resin weighed.

This method can also be used for alkyd resins in which the glycerine has been replaced by other polyvalent alcohols such as glycol and pentarythritol. It can also be applied to the determination of the contents of free maleic acid anhydride in maleic resins.



AMERICAN CHEMICAL PAINT COMPANY AMBLER AGE PENNA.

Technical Service Data Sheet Subject: PROTECTING ALUMINUM WITH ALODINE

ALODIZING IS EASY AND EFFECTIVE

The Alodizing process is a chemical one and does not require electrolytic techniques or equipment. Alodizing is simple, foolproof, low in cost, and requires a minimum of equipment. Essentially, the process consists of the following easily controlled operations or steps:

- 1. Cleaning the work
- 2. Rinsing the cleaned aluminum surfaces
 3. Coating with "Alodine"
- 4. Rinsing with clean water
- Rinsing with acidulated water
 Drying

After treatments. Alodized aluminum provides an ideal bonding surface for paint, wax, adhesive, or other organic finishes. These should be applied in accordance with the manufacturer's directions. Unpainted or exposed areas will be protected by the tough, durable "Alodine" surface.



Flight of the Chance Vought Cutlass, seventh in a line of outstanding fighters and "potentially capable" of flying faster than any other service type jet aircraft in production, land or carrier-based. Substantial surface areas of the Cutlass are constructed of painted Alodized aluminum.

SHORT COATING TIMES AND LOW BATH TEMPERATURES

With the "Alodine" bath at its normal temperature of 120° F., coating time by immersion approximates 11/2 minutes and by spraying, 15 to 20 seconds. Coating times and bath temperatures can be varied to suit operating conditions.

"ALODINE" MEETS SERVICE SPECIFICATIONS

"Alodine" applied by immersion or spray complies with the rigid performance requirements of both industrial and Government specifications. The following is a list of Service Specifications which "Alodine" meets at the present time.

MIL-C-5541 MIL-S-5002 AN-F-20

U. S. Navord O.S. 675 AN-C-170 (See MIL-C-5541) U.S.A. 72-53 (See AN-F-20)

16E4 (SHIPS)

"ALODINE" HAS UNLIMITED APPLICATIONS

Parts can be treated by immersion, by spraying in an industrial washing machine, by flow coating, or by brushing. This means that "Alodine" can be used anywhere, on any part or product made of aluminum. This had led to widespread use of the Alodizing process: 1. by fabricators of aluminum products in all industries to assure the utmost in product protection and finish durability; 2. by manufacturers of aluminum who are supplying Alodized aluminum sheets and coils from the mills.

In general, small size products or parts are processed rapidly and conveniently in immersion equpiment, which can be mechanized if production volume justifies it. For large production of formed parts, or for Alodizing coiled stock, strip, or cut-to-size sheets, a five-stage power spray washer is most convenient. Airplanes trucks, trailers, housing, railway cars, bridges and other large units are Alodized in a simple brush-on or flow-coat process.



WRITE FOR FURTHER INFORMATION ON "ALODINE" AND ON YOUR OWN ALUMINUM PROTECTION PROBLEMS.



CALENDAR **EVENTS**



Annual Conference of the National Association of Corrosion Engineers, Buccaneer

Hotel, Galveston, Tex.

Mar. 13-April 1. ACS, Div. of
Paint, Varnish and Plastics Chemisty. Spring Meeting, Milwaukee,

April 3-5. First Pacific Coast Paint Material and Equipment Exhibit, Biltmore Hotel, Los Angeles,

April 28-30. Spring Meeting of American Oil Chemists Society, Shamrock Hotel, Houston, Tex. April 29-30. Metal Powder Show and Meeting, Drake Hotel, Chi-

cago, Ill.

May 2-3. Joint Meeting of Dallas-Houston Paint and Varnish Production Club, Stoneleigh Hotel, Dallas, Tex.

May 23-24. Spring Symposium of Pacific Northwest Paint and Var-nish Production Club, New Washington Hotel, Seattle, Wash.

Production Club Meetings

Baltimore, 2nd Friday, Belvedere Hotel.

Chicago, 1st Monday, Furniture Mart.

C.D.I.C., 2nd Monday. Cincinnati — Oct., Dec., Mar., May, Cincinnati Club; May, Chichinat Club; Dayton — Nov., Feb., April, Van Cleve Hotel; Indianapolis — Sept., Claypool

Indianapolis Hotel: Columbus

olumbus — Jan., June, Fort Hayes Hotel. Cleveland, 3rd Friday, Harvey

Restaurant.

Dallas, 2nd Thursday, No Fixed

Detroit, 4th Tuesday, Rackham

Building. Golden Gate, Last Monday, El Jardin Restaurant, San Francisco. Houston, 2nd Tuesday, Seven Seas Restaurant.

Kansas City, 2nd Thursday, Pickwick Hotel

Los Angeles, 2nd Wednesday, Scully's Cafe.

Louisville, 3rd Wednesday, Seclbach Hotel. Montreal, 1st Wednesday, Queen's

Hotel.

New England, 3rd Thursday, Puritan Hotel, Boston.

New York, 1st Thursday, Building
Trades Employers Assn.

Northwestern, 1st Friday, St. Paul Town and Country Club. Pacific Northwest, Annual Meetings Only

Philadelphia, 3rd Wednesday, Engineer's Club.

Pittsburgh, 1st Monday, Fort Pitt Hotel. St. Louis, 2nd Tuesday, Forest

Park Hotel. Southern, Annual Meetings Only.

Toronto, 3rd Monday, Diana Sweets, Ltd. Western New York, 1st Monday, 40-8 Club, Buffalo.



Maier of Continental Can Receives Army Award

of

Curtis E. Maier, general manager, Research Division of Continental Can Company, was presented with a Certificate of Appreciation Award by the Department of the Army for patriotic civilian service to the United States during World War II. The Certificate, signed by Hon. Frank Pace, Secretary of the Army, was presented to Mr. Maier by Col. Thomas F. Joyce, Chief of the Illinois Military District, Navy Pier, Chicago, Ill. recently.

Specifically, the award is for services on "The Technical and Industrial and Intelligence Committee, Joint Chiefs of Staff, World War II." From June 17 to August 1, 1945, Mr. Maier was assigned to make a complete investigation of the methods and materials employed by leading can manufacturing companies in Germany, particularly during World War II.

Special emphasis was placed on the manufacture of cans from black plate or other substitute materials used for the conservation of tin and steel, since it was known that the Germans had been investigating this problem since World War I. This was particularly true since Germany had been on a policy of selfsufficiency between World War I and World War II. and had investigated the uses of substitute metals, synthetic resins, synthetic rubber seaming compounds, etc. Included in this survey were investigations of suppliers of raw materials as well as the activities of the can manufacturers themselves.

Also, investigations were made of composite containers and of all paper containers which were being employed as conservation methods for steel as well as tin. Whenever a development observed appeared to be new or novel or was felt to be important or particularly interesting, an effort was made to present the subject objectively and as completely as possible so that others reading the final report would be able to draw their own conclusions. The final report was assembled in London during the month of August, 1945, under the title, "A Survey of the Developments of the German Can Industry During the Second World War" and, after proper clearance was secured, it was made available to industry of all of the Allies.



th BUSTALISED BASE XACTO METERS

Bowser Xacto meters have simplified the measurement and distribution of liquid ingredients in many paint, lacquer and varnish plants. And they do the job with utmost accuracy, simplicity and safety!

GUARANTEED UNIFORMITY FOR YOUR PAINT PRODUCTS

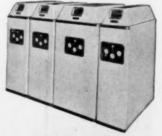
For more than a quarter of a century Bowser Xacto meters have been widely used wherever extreme accuracy has been an important requirement. There's no guesswork and practically no chance for human error because Xactos can be set to deliver predetermined quantities and shut themselves off . . . automatically resetting to zero for the next batch . . . and even printing a delivery ticket when desired.



INDUSTRIAL XACTOS are handling 662 different liquids.

LOWER COSTS, TOO!

... by saving labor, time and storage space ... minimizing rejected batches ... preventing waste and spillage ... reducing accidents and fire hazards.



AUTOMATIC BLENDER for 2 or more liquids. ingredient increments as small as 1/20% if needed.

A Bowser meter engineer will gladly check your plant and make recommendations. No obligation, of course! Write us and set a date.

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SURFACE ACTIVE

(From Page 29)

Lecithin, which is a mixed triglyceride of saturated fatty acids containing phosphorous and nitrogen has been of help in wetting and dispersing practically all the pigments mentioned in the preceeding paragraph excepting carbon black. It is particularly good with chrome yellow. The metallic soaps such a zinc, iron, calcium and copper naphthenate and copper cleate are good wetting and dispersing agents for toluidine red and almost all of

the commonly used pigments. Iron naphthenate and copper oleate are very good for carbon black.

As previously mentioned, too good a dispersion may effect storage stability. Settling and caking of a pigment may occur. Also because of other factors livering or gelatin may result. When these troubles do appear, batches may be reclaimed by the addition of:

- 1. Free acid resins and acids.
- 2. Amines capable of forming salts with acids.

2. Ethyl or butyl alcohol.

Since we know that different pigments have different physical and chemical properties that present variations in surface variations in

surface and interfacial tensions. It is natural to assume that surfaceactive agents will react to modify conditions that cause floating and flooding. Practically the same compounds used in wetting and dispersing pigments are used as antifloating agents, e.g. A combination of Turkey Red Oil and silicone eliminated flooding and floating in an alkyd-linseed oil system where the pigments were a combination of zinc oxides, yellow iron oxide, black iron oxide, and prussian blue.

Precautions

WORD of caution must not be overlooked in the use of these additives. Their reactivity with pigments and vehicles must be carefully watched, particularly when some amides and amines of fatty acids are used which will initiate livering. Some surface-active agents might cause pigments to settle; others will produce foaming; some will dull gloss; and some will kill color brilliance. Finally it should be remembered that those agents that work in one case will not necessarily be effective in other circumstances. By far and large the general usefulness of surfaceactive agents far outweighs their defects.

Sherwin-Williams Receives Government Citation

Special recognition has been given by the United States Government to The Sherwin-Williams Company for the role it is playing in supporting mutual American-European efforts to strengthen the free nations against communism. A "Certificate of Cooperation" bearing the red, white and blue "Strength for the Free World" shield of the Economic Cooperation Administration, and a letter of citation signed by Acting E.C.A. Administrator Richard M. Bissell, Jr., were received this week by A. W. Steudel, President of The Sherwin-Williams Co.

The Certificate states that it is awarded in recognition of the firm's "furnishing technical assistance to the peoples of the Marshall Plan countries to aid them in maintaining individual liberty, free institutions and peace."

A Marshall Plan group (E.C.A.), thirteen paint industry specialists from France, toured the company's Cleveland Plant last fall, studying production facilities, quality control, personnel relations, research and merchandising methods.

McCloskey's No. 10510 UNIVERSAL TINTING PASTE VEHIC

The greatest money-saver and improvement for paint manufacturers since the discovery of titanium. Our technical staff have perfected an entirely new vehicle which is a must in every paint manufacturing plant, not only because it will save the paint manufacturer hours of labor and untold loss through waste such as skinning, hardening, etc., of tinting color, but reduces the tinting color of a manufacturer to one tinting vehicle for all types grinding mediums.

This marvelous vehicle eliminates the necessity of grinding tinting colors in different vehicles to meet the demand of each particular product. Frankly, you cannot afford to be without McCloskey's No. 10510.

Imagine . . . ONE TINTING PASTE FOR--

STYRENATED ALKYDS LONG OIL ALKYDS MEDIUM OIL ALKYDS SHORT OIL ALKYDS HOUSE PAINTS LACQUERS **OLEORESINOUS VARNISH ENAMELS UREA RESINS** CHLORINATED RUBBER MELAMINE RESINS
Order a drum or a five-gallon container of this material at our risk.

100% TINTING COMPATABILITY WITH ALL OF THESE

McCLOSKEY VARNISH CO.

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PUMPING

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(From Page 27)

- to getting as many of one size of pump in a plant as possible. This may mean in some cases, a slightly greater capacity will be handled than is needed, and in other cases a slightly lesser capacity. But identical pumps mean interchangeability and economy in the spare repair parts inventory carried.
- 5. That pumps removed from service for repairs or factory overhauling be cleaned as thoroughly as possible. It is less expensive for you to clean the pumps than for the manufacturers to do this. Besides, a clean pump can receive immediate repairs and the pump may then be returned promptly to you.

I hope that each of you may have been able to get at least one thought from this message of mine, that will be of some aid to you in your future manufacturing plans. I appreciate your attention to me on the subject which I have briefly discussed this evening — and I thank you for the privilege of presenting it to you.

Questions and Answers

What is meant by Static Head and Dynamic Head?

Static Head is the distance from pump discharge to highest point of delivery. Dynamic Head is the sum of the number of feet of static discharge head plus suction lift (in feet), if any, plus friction head in suction pipe and discharge pipe, plus friction head in pipe fittings, plus friction head in pipe attachments, etc.

Is it practical to suck up hot varnish (500-600 F.)?

Yes, but the pump must be placed close to the material being pumped and it is also advisable that the pipe from the pump to the ource of supply be pitched when pumping lot materials.

What is the furthest distance vehicles can be pumped?

This is dependent on the horse power of he motor of the pump. Generally speaking, 100 lbs. is equivalent to 231 feet. Maximum power used in the paint and varnish industry is between 200-300 lbs.

Is by-passing important in pumping vehicles?

Yes, if there is a possibility that the pump will keep operating after the discharge valve

is closed. It has been observed by some vehicle manufacturers that too much by-passing causes a darkening of the vehicle.

When are vari-drives used?

Vari-drives are used when different capacities are required and when materials of different viscosities are to be pumped.

In filter-press work, what would be the best arrangement to obtain as nearly as possible an even flow of filtered material?

With the present types of pumps it would be very desirable to have an automatically controlled filter-press pump.

Are there any advantages in using replacement parts made of dissimilar metals in our present day pumps?

In positive displacement pumps with metal to metal contact, it has been found that using dissimilar metal parts slows up wear because dissimilar metals make for better bearing surfaces than like metals.

G-E Appointments

Frederic W. Hammersfahr of the General Electric Company's Chemical Division, has been appointed in charge of the Chemical Process Development Laboratory's Pittsfield group.

Edward J. LeBeau has been appointed quality control supervisor of the phenolic products plant of the General Electric's Chemical Division.

John L. McMurphy has been appointed general manager of the Plastics Department; Sam L. Brous has been named general manager of the Chemical Materials Department; James W. Raynolds has been appointed marketing manager of the Chemical Division; and Dr. Alphonse Pechukas has been named engineering manager of the Chemical Division.

CABOT paint BLACKS

CABOT BLACK	Nigrometer Scale (color value)	Particle Diameter Millimicrons	Surface Area M ² /gm	Volatile Matter %	Oil Absorption Lbs/100 Lbs. Black	Tinting Strength
Sterling R	99	80	21	0.8	65	100
Sterling V	96	51	35	0.9	100	90
Sterling 10	94	41	40	0.8	120	120
Sterling 99R	93	40	50	0.9	80	150
Monarch 81	81	22	120	5	85	184
Elf O	80	21	200	6	85	180
Monarch 74	74	17	300	5	90	185
Monarch 71	71	16	380	5	100	170
Supercarbovar	69	15	400	- 5	110	170
Carbolac 46	65	14	660	14	125	155
Carbolac 1	5.8	10	1000	17	160	155

A Complete Range





Conducted by

Lancaster, Allwine & Rommel

PATENTS AND COPYRIGHTS

424 Bowen Building, Washington, D. C.

Complete copies of any pattents or trade-mark registration reported below may be obtained by sending 50c for each copy desired to Lancaster, Allwine & Rommel

Wax Compositions

U. S. Patent 2,573,422. John J. Fish, New York, N. Y., assignor to Sun Chemical Corporation of New York, N. Y., a corporation of Delaware.

A wax composition characterized by the property of forming stable emulsions in water, which emulsions upon drying form highly glossy films, consisting of the product obtained by subjecting a hydrocarbon wax material comprising predominantly hydrocarbons solid at normal room temperatures to treatment, at a temperature of at least 275°F... but below 400°F. with an oxygen-containing gas in the presence of an oxidation catalyst, approximately 0.3 to 0.7% by weight based upon the weight of said hydrocarbon wax material of chlorinated paraffin, and approximately 0.5 to 1.0% by weight based upon the weight of said hydrocarbon wax material of a material selected from the group consisting of drying oils, blown drying oils, semi-drying oils, blown semi-drying oils, and mixtures thereof, said oxygencontaining gas being introduced at the rate of approximately 1.7 cu. ft. per hour per pound of said wax material, said wax composition having an acid number not less than approximately 12 and not greater than approximately 30, a saponification number not greater than 85, a ratio of saponification number to acid number of at least 2 to 1, and a penetration value below 10.

Vinyl Resins

U. S. Patent 2,579,572. John G. Hendricks, Chatham, N. J., assignor to National Lead Company, New York, N. Y., a corporation of New Jersey.

A method for producing a light stable vinyl chloride resin composition which comprises first forming an intimate mixture of a finely-divided salt selected from the group consisting of sodium phosphite and potassium phosphite and barium ricinoleate in proportion so that for each part of salt there are present from 0.1 to 3 parts of barium ricinoleate and subsequently incorporating this mixture in a vinyl chloride resin composition in proportion so that the amount of phosphite salt present in the final composition will be from 0.5 to 10 parts by weight.

Smoking Pipe Coating

U. S. Patent 2,580,079. Henry A. De Phillips, Nutley, N. J.

A coating composition for tobacco pipes comprising by weight: nitrocellulose about 20 to about 23 percent, dicaprylate of triethylene glycol about 6 to about 9 percent, and solvents about 71 percent.

111

Drying Oil Composition

U. S. Patent 2,578,214. James P. West, Westmont, Ill., assignor to Universal Oil Products Company, Chicago, Ill., a corporation of Delaware.

A drying oil composition comprising (1) from about 20% to about 95% of a normally non-drying hydrocarbon oil containing a mixture of polyolefinic hydrocarbons having molecular weights of at least 2000 and formed by a low temperature catalyzed co-polymerization of a di-olefin and a mono-iso-olefin, and (2)



THE RESIN SITUATION

FRANK G. OSWALD

Asst. Director of Sales Hercules' Synthetics Department

Official Washington sources believe phthalic anhydride will be on the critical list at least until 1953. Therefore, it's good news to learn that efficient and highly useful paint liquids can be produced without the use of phthalic alkyds.

An exclusive, new development of Hercules research has come along at just the right time to help lick this problem. It's a hard resin that can be used to replace phthalic alkyds for many uses. Pentalyn® B-56 resin produces semialkyd-type liquids merely by heating with any one of the common, unbodied oils. These liquids can be tailor-made for spars, floor-paint liquids, gloss, semigloss and flat wall paint vehicles, and many other finishes in demand today.

Let me show you how Pentalyn B-56 can help you. Write to me—I'll be glad to send you data, technical information, and a five-pound testing sample.

HERCULES POWDER COMPANY

Synthetics Dept., 926 Market St., Wilmington 99, Del.



from about 5% to about 80% of a mixture of polyolefinic cyclic hydrocarbons recovered from a sludge formed in a conjunct polymerization reaction and having in their structure conjugated and non-conjugated unsaturation in which the conjugated unsaturation predominates.

Surface Protecting Materials

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U. S. Patent 2,579,610. Antonio S. Pitre, United States Navy, San Francisco, and John Rudolph Saroyan, Vallejo, Calif.

An antifouling composition comprising an antifouling toxic and a matrix, said matrix being formed by intimately mixing 5 to 70 parts of a plasticizer with 100 parts of a resin, said resin being produced by blending 1 part of a polymer with from 1.5 to 7 parts of a film former selected from the group consisting of rosin, yacca gum, hydrogenated rosin, abietic acid, the resinous adduct of maleic anhydride and a monocyclic terpene possessing the p-cymene skeleton, and mixtures thereof, the temperature of at least the polymer having been elevated to from 275°F to 325°F, to partially polymerize and dehydrate the same, the temperature of the polymer never exceeding 325° F. during the entire process, said polymer being formed by reacting, to the point at which the aldehyde odor disappears, on aqueous mixture containing a monohydric phenolic constituent and a monoaldehyde constituent, the mol ratio of the phenolic constituent to the aldehyde constituent lying within the range of 2.5 to 1, and a metallic-compound catalyst and buffer for the phenol-aldehyde reaction selected from the group consisting of lead acetate, cupric acetate, litharge, and lead salicylate in the amount at least 0.01 mol per mol of aldehyde constituent.

Coating Composition

U. S. Patent 2,580,023. Kurt Helmholtz, Flensburg, Germany; Margarete Kitti Helmholtz, administratrix of said Kurt Helmholtz, deceased, assignor to Goodcliff-Eecen Industries Pty. Limited, Sydney, Australia, a corporation of New South Wales, Australia.

A coating composition comprising about 5 parts by weight of a chlorinated derivative of a material selected from the class consisting of rubber, and synthetic chlorinated polydiolefins chlorinated to such a degree that the viscosity of a 25% solution in toluol is less than 40 seconds Saybolt, about 15 parts by weight of an organic solvent for the chlorinated rubber, about 80 parts by weight of a heavy metal powder selected from the class of metals consisting of lead, copper, zinc, chromium, cotalt, nickel and tin, and a catalyst functioning as an oxidation catalyst for the

heavy metal powder and as a corrosion inhibitor when the coating composition is applied to a ferrous metal surface selected from the group consisting of the chlorides of osmium, ruthenium, rhodium, iridium, platinum and paladium and potassium osmiate, potassium rutheniate, potassium rhodiate, potassium platinate and potassium paladate, said catalyst in amounts of about 0.00025 to 0.0001 parts by weight of the total composition.

Styrenated Alkyd Melamine

U. S. Patent 2,580,289. Joel Fantl, Springfield, Mass., assignor to Monsanto Chemical Company, St. Louis, Mo., a corporation of Delaware.

A curable heat reaction product of 100 parts of a modified alkyd resin with

from 10 to 1000 parts of a modified melamine resin, said alkyd resin consisting essentially of a soluble fusible copolymer of an unsaturated monomeric material taken from the group consisting of polymerizable monovinyl aromatic hydrocarbons containing no aliphatic unsaturation other than the vinyl group, ring-substituted alkyl derivatives thereof, ring-substituted chlorine derivatives thereof and alpha-alkyl substituted derivatives thereof, with a drying oil alkyd resin containing from 40 to 65% by weight of a drying oil in chemical combination, said alkyd resin having been prepared from a polyhydric alcohol containing at least three hydroxy groups and a polycarboxylic acid free from nonbenzenoid unsaturation, the ratio of oilmodified alkyd resin to unsaturated



monomer varying from 100:50 to 100: 150 on a weight basis, said melamine resin comprising the product of the reaction under alkaline conditions between 1 mol of melamine, 1-6 mols of for maldehyde, and an aryl sulfonamide followed by the reaction of said product with a monohydric alcohol under acid conditions, the aryl sulfonamide being taken from the group consisting of benzene sulfonamide and benzene sulfonamides substituted in the ring by an alkyl group and being present in the ratio of from 0.1 to 1.0 mol per mol of melamine.

Rubber Dispersions

U. S. Patent 2,580,040. Robert E. Munsell, Morris Plains, N. J., assignor to The Patent and Licensing Corporation, New York, N. Y., a corporation of Massachusetts.

A viscous rubbery dispersion having a viscosity of at least 10,000 centipoises and comprising a rubbery material from the group consisting of natural rubber, polymerized 2-chlorobutadiene-1, 3 and butadiene styrene copolymers dispersed in an aqueous medium, said dispersion consisting predominantly of solids, the rubbery material representing the major proportion of the solids, and containing from .5% to 3% of casein and from .1% to .6% of an alkaline buffer salt based on the weight of the rubbery material and being characterized by good viscosity stability, the viscosity of said dispersion remaining substantially unchanged over a period of several days.

Synthetic Oils

U. S. Patent 2,579,499. Wesley A. Jordan and Harold Wittcoff, Minneapolis, Minn., assignors to General Mills, Inc., a corporation of Delaware.

Process of clarifying a synthetic oil derived by the esterification of a fatty acid with a polyhydric alcohol in the presence of a lead esterification catalyst, which comprises treating the oil with phthalic anhydride in a quantity of from one-half to twenty moles per mole of lead present in the oil, and removing the precipitate thus formed.

LANCASTER, ALLWINE & ROMMEL

REGISTERED PATENT ATTORNEYS

Suite 424, 815 — 15th St., N.W. Washington 5, D. C.

Patent Practice before U. S. Patent Office. Validity and Infringements Investigations and Opinions.

Booklet and form "Evidence of Conception" forwarded upon request.

Coating Composition

U. S. Patent 2,582,500. Kenneth Potter Monroe, Boston, Mass., assignor to Standard Dyewood Company, Medford, Mass., a corporation of Massachusetts.

A coating composition comprising a solution of an acid resin from the group consisting of the carboxy-alkyl aralkyl ethers of a catechol type of tanning agent and of the aralkyl ethers of a formaldehyde condensation product of a carboxyl-alkyl ether of said tanning agent, one to two of the phenolic hydroxyl groups of said tanning agent being etherified by an aralkyl radical and the remaining phenolic hydroxyl groups being etherified by carboxy-alkyl radicals which contain two to three carbon atoms, and a Paraguayan wax of the carnauba type.

Pigment Dispersion

U. S. Patent 2,581,414. Seymore Hockberg, Upper Darby, Pa., assignor to E. I. du Pont de Nemours & Company, Wilmington, Del., a corporation of Delaware

The method of dispersing a commercial pigment in a film-forming material, which comprises agitating the pigment and film-forming material with a sand which is of 20-40 mesh size, and remains within about this size range, the agitating being continued until the commercial size pigment is reduced to a fineness of not more than 0.0005 inch when measured on a scrape-type fineness of grind tester that is graduated from 0.002 to 0.0000 inch, and separating the sand from the dispersed pigment and film-forming material.

SPECIFICATION DATA

ALUMINUM POWDER and PASTE

A. S. T. M. -- D -- 962-49 dated 1949

Type 1 — Powder Class A-30XD — Class B-40XD — Class C-3XD

Type 2 — Paste Class A-30 — Class B-40 — Class C-3A

TT-A-468a — October 7, 1949 — Amendment 1

Type 1 — Powder Class A-40XD — Class B-30XD — Class C-3XD Type 2 — Paste Class A-40 — Class B-30 — Class C-3A

JAN-A-512 — Amendment 1 Grade 1 — 120 Atomized Powder

Grade 2 — No regular product

JAN-A-289 — Amendment 1 (Army 50-11-43B) (Navy 51A26)

Type B (Atomized-Grained) — Class C — 120 Atomized Type C (Atomized) — Class C — 120 Atomized

AMS-3128 — Aeronautical Materials Specifications — 42 Paste

M69-48 — American Association of Highway Officials Specifica-

tions — 30 Paste

TVA — Standard No. C-43 A also Standard No. C-100 — 30 Paste

Rock Island Corps of Engineers

Priming Aluminum Paste — 3A Paste

Finish Aluminum Paste — 30 Paste

Aluminum Powder — 5XD Powder

Upper Mississippi Valley Division Corps of Engineers

Priming Aluminum Paste — 3A Paste

Finish Aluminum Paste — 30 Paste

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Witco Chemical Company is now issuing a 12 page Technical Service Report on Mildewproofing Agents with emphasis on 8 per cent copper naphthenate and other chemicals with respect to Government Specifications.

A brief description is given of the methods used for mildewproofing materials and some of the products used for this purpose, together with abstracts of many of the government specifications on mildewproofing requirements.

Also included is an index of the specifications abstracted so any particular specifications can be easily located. For copies, write to Witco Chemical Company, 295 Madison Avenue, New York 17, New York, for report P-17.

MATERIAL HANDLING CASE STUDY

Baker Report 3061, released by the Baker Industrial Truck Division of The Baker-Raulang Company, 1250 W. 80th St., Cleveland 2, Ohio, contains detailed handling information on the West Penn warehouse operation. Action photos are used to make operating details easy to understand. Report 3061 is one in a continuing series of materials handling case studies offered to industry by The Baker-Raulang Company.

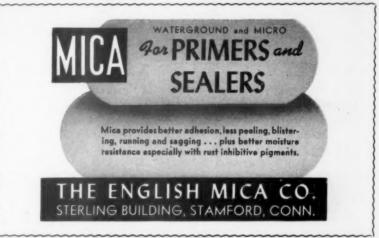
FLOW METERS

A new forty-page bulletin describing the company's "Series 500" line of Flow Meters has just been published by The Bristol Company of Waterbury, Conn. The Bulletin, No. F1605, describes instruments for recording, integrating, indicating, automatic controlling, and telemetering the flow of steam, water, air, gas, oil, solutions, and other fluids. Both mechanical and electric type flow meters are described in a full range of models suitable for a wide variety of uses in industrial plants, utility companies, and process control work.

COLD STABILITY OF LEAD TALLATE DRIERS

New, more stringent products specifications requiring flow at zero degrees Fahrenheit are passed by Nuolate Lead 24%, according to Nuodex Products Company, Inc., Elizabeth, N. J. manufacturers of this tallate type lead drier for paints and allied compositions. This announcement was made in a mailing piece, "When It Snows It Flows."

Before the cold stability of Nuolate Lead 24% improved, a problem in using lead tallates was that they often crystalized or solidified at freezing temperatures. Recovery in the drum at room temperature took weeks or even months unless direct heat was applied, causing the manufacturer a loss of time and money. However, laboratory tests of Nuolate Lead 24% have shown that it even retains its flow at 30° below zero.





RESIN EMULSIONS

Revised information about a series of resin emulsions containing 40 to 45 per cent solids is available in a new leaflet from Hercules Powder Company, Wilmington, Del. The leaflet is entitled "Dresinol."

These low-priced resin dispersions are compatible with animal glues, starch, dextrins, corn and soybean proteins, water dispersions of phenol- and urea-formaldehyde resins, and casein.

The properties imparted by Dresinol suggest its use in laminating, heat-sealing, and wet-type adhesives; emulsion paints, coatings and sizings; industrial fabric finishes; and binders for various types of fibrous and inorganic materials.

FLUID PROCESSING EQUIPMENT

Bulletin describes the application of a wide range of equipment to precision processing of fluids liquids, air and other gases. Heating liquids, in batches and continuously; liquid phase separation; clarification, polishing and cold sterilization are described briefly. Liquid, dirt and petroleum vapor removal from air or gas; air and gas drying; and flow rate indication are other processing considerations included in the bulletin. Eight types of equipment used in fluid processing are illustrated. Available upon request to Selas Corporation of America, Philadelphia 34, Pennsylvania.

COATING TERMS

Over 200 definitions of terms commonly used in industrial products finishing are contained in a new 16 page booklet, "Glossary of Industrial Coating Terms," produced by the General Industrial Division of The Sherwin-Williams Co. Copies may be obtained by writing on company letterhead to The Sherwin-Williams Co., General Industrial Division, 101 Prospect Ave., N.W., Cleveland 1, Ohio, or from any Industrial Zone Office in Cleveland, Ohio; Grand Rapids, Michigan; Philadelphia, Pennsylvania; Newark, New Jersey; Chicago, Illinois; Atlanta, Georgia; Dallas, Texas: or Oakland, California

FILTER PRESSES

32-page booklet gives complete information on filter presses for separating solid particles from a mixture of liquids and solids. Description of types offered including specifications, capacities, construction material, requirements and costs are discussed in detail in this booklet T. Shriver & Co., Inc., 810 Hamilton St., Harrison, N. J.

TESTING EQUIPMENT

Catalog covers some 80 items used in the testing of paints, varnishes and allied coatings. Description of each apparatus is given together with photographs, specifications, and recommended tests. Prices of each item are also included. Gardner Laboratory, Inc., Bethesda, Md.

ALUMINUM CANS

With government and industry focusing attention on every possible method of conserving our meager tin supply, the new booklet, "How Aluminum Can Save Tin," just published by Reynolds Metals Com-





PHOTOVOLT Photoelectric GLOSSMETER



For reliable gloss measurements according to ASTM D523-49T on paints, varnishes, and lacquers.

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Tristimulus Colorimetry with 3 Filters
 Sheen Measurements at 85 Degree Incidence
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 in accordance with Federal Specifications TT-P-141b

Portable, rugged, simple to operate Write for Bulletin #677 to

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STOP SAGGING with [Panbo 6



MAKE THIS TEST FOR YOURSELF

SAGGY PAINT

... corrected with RAYBO 6

As part of the initial formulation, Raybo 6 assures a fin-ished point with definite anti-sagging property. This unique compound may also be used as a corrective: if a batch of paint flows too freely, addition of Raybo 6 to the finished paint confers sag resistance. Furthermore, Raybo 6 improves drying, adhesion and film qualities. Interested? Send for all the facts and a sample.

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pany, Louisville, Ky., is most timely because it presents improved packaging methods that replace the ordinary "tin" can. These new packages can be made on standard automatic high-speed packaging equipment readily available.

ALUMINUM POWDERS AND PASTES

"Aluminum Powders & Pastes" is a new 84-page manual published by Reynolds Metals Company, 2500 South Third Street, Louisville, Kentucky. It covers not only the more familiar uses of powdered aluminum in aluminum paints, ir-

ridescent auto finishes, roof coatings and the like, but also descirbes such unique applications as chemical reactions which provide heat without flames, sea markers that help locate downed airmen, bombs whose destructive power is doubled by powdered aluminum, powder metallurgy, surgery, silicosis treatment and other amazing developments.

TURPENTINE DERIVATIVE

"Nopol—Its Properties, Reactions and Derivatives" is the subject of a new technical bulletin issued by the Naval Stores Division of the Glidden Company of Cleve land describing this turpentine derivative and its potentialities as a low-cost raw material with manindustrial possibilities.

The bulletin not only lists the properties of Nopol but gives in detail the experiments in which its possibilities have been studied. It is produced by the condensation of formaldehyde and beta pinene, a major constituent of turpentine.

INDICATORS

A bulletin describing "Trin-Vuc Sight" flow indicators has been issued by Trinity Equipment Corporation, 472 Westfield Ave., East, Roselle Park, N. J., manufacturers of Thermowells, Sight Flow Indicators and other process equipment.

The new bulletin describes the features of these indicators emphasizing its positive seal, light weight and tamperproof construction.

Shown in the bulletin is an overall dimensions chart and schedule of pressure ratings, as well as specifications of these indicators.

TALL OIL IN EMULSIONS

"Tall Oil in Emulsions" is the ninth in a series of tall oil bulletins issued by The Tall Oil Association, 122 E. 42nd St., New York 17, N. Y. This bulletin discusses the availability of tall oil, emulsions, emulsifiers, the making of emulsions and equipment for the making of tall oil emulsions. Other subjects included are soluble oils, polymerization, cutting oils and asphalt emulsions.

ALKENYL SILANES

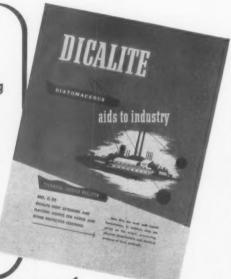
Data on the physical properties, typical reactions, applications, and availability of both vinyltrichlorosilane and vinyltriethoxysilane are presented in a new technical data sheet issued by Linde Air Products Co., Div., Union Carbide and Carbon Corp., 30 E. 42nd St., New York 17, N. Y.

CMC DATA

Physical and chemical properties as well as various applications of CMC (cellulose gum) are covered in a technical bulletin recently issued by the Hercules Powder Co. Wilmington, Del. Included is information on types available, viscosity, compatibility, and other pertinent data.



- ...improve durability, brushing and leveling qualities.
- ... extend your supply of titanium pigments.
- ...maintain high production and quality and save money.



covered in the *Newised*DICALITE* Technical Service Bulletin C-21
on inert extenders and flatting agents

This revised Bulletin C-21 summarizes results of 5-year exposure tests of outside house paints using Dicalite inert extenders. Complete physical and chemical data are listed on all Dicalite materials. Typical formulations are given for inside and outside house paints, flat varnishes, traffic paints, etc. The bulletin explains how Dicalite increases the hiding power of prime pigments—produces given hiding power with less prime pigment and without harm to color—also strengthens the film, improves brushing, leveling and washability.

SEND FOR YOUR COPY OF BULLETIN C-21-NO CHARGE

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MULTI-WASH

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inisiei offers better control of fumes and odors inside and outside the plant

The Schneible Multi-Wash Collector offers superior efficiency in the control of fumes and odors in the cooking of varnish.

Advantages of the Multi-Wash method are many ... reuse of water or other collecting liquid ... no nozzles to clog and clean ... no secondary fume or vapor problem—prevents fire or explosion ... cools hot gas or air ... constant water pressure at all times ... settling and reclaiming of valuable materials in recirculating tank ... and of course long, trouble-free performance with practically no maintenance.

Flexibility too—Multi-Wash is furnished in many sizes for single or multiple kettle operations. Installations may be inside, overhead to conserve floor space or outside the building.

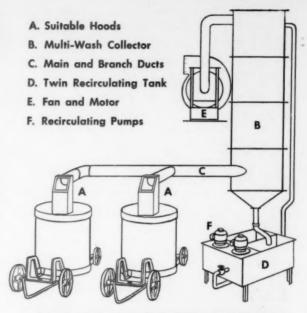
Write for Varnish Bulletin No. 551 for complete details.

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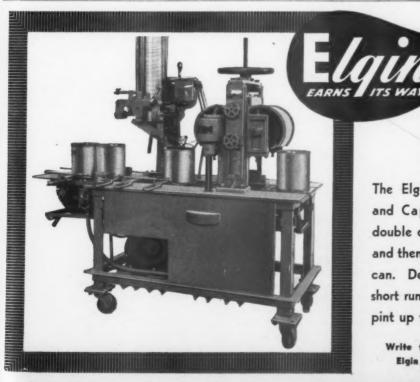
Multi-Wash Collectors • Uni-Fio Standard Hoods • Uni-Fio Compensating Hoods • Uni-Fio Fractionating Hoods • Water Curtain Cupola Collectors • Ductwork • Velocitrap • Dust Separators • Entrainment Separators • Settling and Dewatering Tanks • "Wear Proof" Centrifugal Slurry Pumps



Multi-Wash System for Multiple Varnish Kettle Operation

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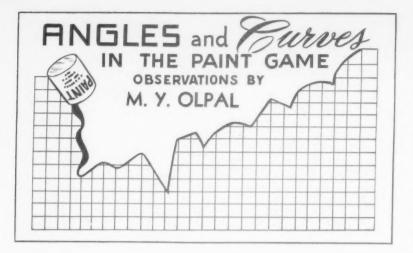


COVER DROPPER and CAPPER

The Elgin Automatic Cover Dropper and Capper automatically places double or triple friction plugs on cans and then securely seats the plugs in the can. Designed for long or frequent short runs in all sizes from one-quarter pint up to and including gallons.

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"A NYTHING interesting?" I asked Jane as she sorted the mail.

"Doesn't look like it," she replied. "You got a bill for the Help Wanted Ad in the paint magazine. But I don't see any answers yet."

"Yet?" I inquired raising my eyebrows. "You mean 'still,' don't you? We've had that ad running for several weeks, and the couple of replies we received were from prize misfits who didn't know a tinting paste from tooth paste." My fingers drummed a staccato on the desk. "Guess I'll go see the boss," I said abruptly.

"Well, what got into you?" Jane greeted me as I whirled into the office after the conference. "You look as if your battery has been

supercharged."

"It has, Janie. It has." I replied with a grin. "I feel as pleased with myself as if I finally wrangled that date with you that you keep pushing off."

"Now, now, Olpal. None of that," Jane said as she gave a quick primp to her hair. "What happened? Did you get a raise?"

"Not exactly. But the boss agreed to let me try a plan I've always favored."

"What is it?" she asked humor-

ing me.

"It's about that ad we're running," I began. "We need several trained men, but we can't get them."

"That's nothing new."

"No, it isn't. But what is new is that we don't need them," I smiled. "Don't need them?" Jane looked puzzled. "What happened? Did the business fall apart this morning?"

"No. In fact, business is booming. We don't need trained men because we've got them. We've had them all along."

"Humph." Jane snorted. "I don't know if you're going to keep them. The way I've heard them grumbling about you working their ——. Well, I don't think they would agree with you about not needing more men."

"Oh, yes they will," I replied. "We've got the trained manpower, but instead of using it 40 hours a week, we've only been getting 10 or 20 hours a week."

"Why, Mr. Olpal!" Jane exclaimed with a gasp of anger that set her form fitting sweater stretch-

ing

I greeted the display with an admiring glance. "Let me explain," I finally added. "We are only getting 10 or 20 hours of trained help instead of 40. The rest of the time, those chemists are cleaning panels, washing ball mills, spraying panels, making mixoffs and all sorts of things that anybody could do with a little supervision. My idea is to get untrained, low paid people for all such activities. We will have a lot more hands around here than ever before, but our chemists won't be any busier than they are right now."

"I'm beginning to see," Jane remarked.

"Simple, isn't it? We take high school graduates. Train them in several of the simpler tasks and let them go to work. Our chemists will be utilized at peak efficiency. Instead of running soap immersion tests, and hardness rocker tests, and drying time tests, they will have trained flunkies to do those routine jobs. The chemists will spend more time figuring out what to do and how to do it then just simply doing it. And they will have more time to help cut our sales force, too."

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"Why that sounds pretty good," Jane said.

"Thank you," I continued waxing eloquent. "To me, the entire process of educating chemists is a process of giving him the knowledge so that he can use his hands effectively. You can call it mindmuscle-coordination. What I'm trying to do, is carry it another step. Coordinate the trained minds of my men with other people's hands. It's logical. The industry calls people with such technical leadership or ability 'group leaders.' But I don't think they know what makes one man a good group leader and another one not. I've always felt the basic requirement was this mind-other-people's-hands-coordination that made the difference. Now, I'm going to put it to practice."

"You mean all your chemists are going to be group leaders." Jane

asked.

"No. But all the chemists are going to be shorn of the routine portions of their job. And in so doing they will learn how to be group leaders. Then they can go to another company in such a capacity."

"What! Jane exclaimed. "You mean you are going to give your

men away?"

"Sure. In fact, I'll even help them locate something. We won't have enough group leader jobs always available to take care of all the talent we'll have. But by not limiting them only to the opportunities we have here, we get their wholehearted cooperation in putting the scheme over. After all, we'll have a continual influx of people on their way up. If our men know there is a definite cooperative attitude for them to get ahead whether in this company or in the industry, they will be in there pitching all the time. They

(Turn to Page 65)

NEW FRONTIERS

(From Page 33)

ticularly in certain phases of biochemical research. The necessity of employing a mass spectrometer, however, severly restricts their use. Since we are not interested in industrial applications concerned with living organisms, applications involving stable isotopes will not be discussed.

Useful Isotopes

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In the next few paragraphs a brief description of the more useful isotopes is presented. Hydrogen can be obtained in the form of the stable deuterium and the radioactive tritium. Unfortunately, the masses of these isotopes are two times and three times respectively that of normal hydrogen; consequently noticeable differences in the reaction rates can be observed. Care must be exercised, therefore, in the use of hydrogen isotopes and in the interpretation of the results.

Three isotopes of carbon are available, namely, carbon-11, carbon-13 and carbon 14. Carbon-11, with a half life of 20.5 minutes, has extremely limited use; carbon-13 is a stable isotope and is limited to applications utilizing the mass spectrometer, while the long lived carbon-14, with a half life of about 5360 years, is radioactive. Carbon-14 is probably the most valuable isotope for organic research and new applications are being found for it almost daily.

Radioisotopes of nitrogen or oxygen having a reasonably long life have not been discovered; consequently tracer work with these elements is restricted to the stable nitrogen-15 and oxygen-18. On the other hand, sodium exists in nature as a single isotope, sodium-23. However, two radioisotopes have been synthesized, namely sodium-22 having a half life of 3.0 years and sodium-24 having a half life of 14.8 hours.

Phosphorus occurs naturally as a single stable isotope, therefore the radioisotope, phosphorus-32, half life 14.3 days, must be used in tracer work. Sulfur offers several good possibilities including an 87.1 day radioactive sulfur-Chorine and potassium possess radioisotopes of either too short a half life or too weakly radioactive to be of general value. Calcium is readily available in the form of a 180 day calcium-45. A satisfactory manganese or copper isotope is still unavailable. Iron is available in several suitable forms, both radioactive and stable. The following table lists the more important elements which are commercially available at the present time.

Commercial Radioactive Elements (Supplied as various salts)

Element	Atomic Weight	Half-Life
Antimony	125	2.7 years
Arsenic	77	40 hours
Barium	140	12.8 days
Bismuth	210	5 days
Cadmium	115	43 days
Calcium	45	180 days
Carbon	14	5360 years
Cerium	141	30.6 days
11	144	275 days
Cesium	134	2.3 years
Chlorine	36	1,000,000 years
Chromium	51	26.5 days
Cobalt	50	5.3 years
Germanium	71	11.4 days
Iodine	131	8.0 days
Iron	55	4 years
44	59	46.3 days
Mercury	203	43.5 days
Nickel	63	300 years
Phosphorus	32	14.3 days
Selenium	75	125 days
Silver	110	225 days
Sulfur	35	87.1 days
Strontium	90	30 years
Thallium	204	3.0 years
Tin	113	105 days
Tritium	3	12.1 years
Tungsten	185	73.2 days
Zinc	65	250 days

Terminology

An acquaintance with terminology in the field of radioactivity isotopes is important. The extreme sensitivity of the radioactive tracing procedures can be readily explained by some simple calculations. One of the best methods of determining and identifying a radioelement is to measure the rate of disintegration. It has been found that the number of radioactive atoms that decompose per second is directly proportional to the number of atoms originally present. Thus

 $(1)-dN/dt+kN_o$

where k is the decay constant and N_o is the number of atoms of the element originally present. If each disintegration is accompanied by the expulsion of a single particle, such as a beta particle, then kN_o is also the rate at which such particles are expelled from the N_o atoms of radioactive material.

Solving the above equation, it is found that

(2) $N/N_o = e^{-kt}$

where N_o is the number of radioactive atoms present at time t=0. A quantity often used, instead of k, to describe the decay of radioactive element is the half life period T, the time required for the activity to be reduced to one half its initial value. Thus $\frac{1}{2} = e^{-kt}$ and

 $\frac{1}{2} = e^{-kt}$ and (3) $T = \ln^{1}/2 = 0.693 N/k$.

If T is expressed in seconds, then equation (3) gives the emission rate in terms

of the number of particles expelled per second from N atoms of the given radio-element.

Because isotopes exist in nature in varying degrees of abundance and measurements consist of determining the ratios of abundance of the two or three most common isotopes of an element in question, a special unit has been adopted. With normal nitrogen, for example, the ratio of nitrogen-15 to nitrogen-14 is 38/9962. In other words, 38 out of 10,000 nitrogen atoms are nitrogen-15. This ratio is more conveniently expressed as "atom per cent," which in this case is 0.38.

Measurement

Although a description of isotope measurement methods is beyond the scope of any chemical discussion, an understanding of their limitations is essential in planning experiments and a brief presentation must be included. The precision and sensitivity of isotope concentration measurements depend upon the type and design of the instrument used. In general, the ratio of abundance can be determined within a probable error of 1% down to 0.2%, depending on the element and the absolute value. In the low ranges, the absolute sensitivity is in the vicinity of 0.004 atom per The sample size required for analysis is quite small, being of the order of 50 microatoms of the element. Advances in the field of isotope mass determination are being made at a rapid rate and these figures are far from final.

A particle counter, such as an ionization chamber, or a Geiger-Muller (G-M) counter, can, in principle, detect a single particle, but if reasonably accurate measurements are to be made, the counting rate must appreciably exceed the background rate due to extraneous causes, such as cosmic rays and atmospheric radioactivity. A minimum practical value for the rate of counting may be taken to be about 20 counts per minute, although a minimum of 50 would be preferable. In general, unless special precautions are taken, something like 10 per cent of the particles from a given source will actually enter the counter. Therefore a quantity of radioactive material emitting particles at the rate of approximately 200 per minute, or about 4 per second, is the smallest amount that can be measured satisfactorily.

If the rate of emission is set at 4 the resulting value of N in equation (3) would be

(4) N = 4T/0.693 = 6T atoms.

This gives, roughly, the minimum number of conveniently detectable radioactive atoms having a half life of T seconds. In order to see what this quantity implies in grams of the isotope, the result given above should be multiplied by the mass number A, and divided by the Avogadro number, 6.02 x 10^{23} (the number of atoms per mole of isotope). In this manner it is found that the minimum weight of a radioactive species capable of detection can be approximately given as 10^{-23} TA grams. The smallest mass of a particular radioelement which can be used in a tracer experiment is thus shown to be proportional to its half life and to its mass number. The shorter the half life and the lower the mass-number the smaller will be the minimum weight suitable for convenient detection.

For example, the half life, T, of radio-carbon-14 is about 5360 years, or 1.7×10^{11} seconds; the mass number is 14, and so the minimum detectable weight of this isotope is found to be close to 2×10^{-11} grams, that is 0.000000000002 grams, an unbelievably small amount. Extremely minute quantities of radio-active tracers, far too minute for detection in any other way, can thus be observed by means of a G-M or similar

counter.

The material used for tracer work rarely, if ever, consists of the pure radioisotope. The proportion of active species is frequently expressed in terms of
the specific activity of the material and
defined as the ratio of the number of
atoms of the given radioactive isotope
to the total number of atoms of the same
element. The specific activity, as defined in this manner, is thus the fraction of the given element that is present
in the form of a particular radioisotope.

For practical purposes, another quantity, also called the specific activity, is used to express the rate of decay of unit weight of radioactive material. In other words, it indicates the rate of emission of charged particles. Since the detection depends on these particles, this form of specific activity gives a more useful and practical indication of the amount of the tracer element present in a particular specimen. In order to understand the alternative definition it is necessary to consider the unit called the curie, which is frequently encountered in radioactivity studies. At the present time the curie is defined as the quantity of any radioactive material giving 3.70 x 10¹⁰ disintegrations per second.

The specific activity of a given substance is then expressed as the number of curies (or millicuries, which is one thousandth part of a curie) per gram (or milligram) of the element present, the weight to include both active and stable isotopes. On this basis, the specific activity of pure elemental radium is 1 curie per gram.

Low Energy Elements

A number of difficulties exist, particularly in the use of elements having low energy radiations such as carbon-14.

The use of G-M tubes with a window (so that the sample is outside the tube) results in loss of a certain fraction of the radiation by absorption in the window and by self absorption. The latter is due to absorption in that part of the sample that is between the disintegrating atom and the G-M tube. The consequence of this effect is that an increase in the weight of the sample does not increase the observed activity proportionately, so that it is not possible to determine values of the specific activity (activity per gram of samples) below a certain minimum. Almost all window G-M tubes are placed on only one side of the sample, a factor resulting in the loss of much activity. At least half the radiation goes in the other direction. It is apparent from these considerations alone that the measurement of the absolute activity requires the estimation of several correction factors, making high precision difficult. Fortunately, the exact activity figures are rarely necessary and in most cases relative activities will Using some of the original suffice. labeled material, it is necessary to prepare a set of diluted standards, and from these, prepare a calibration curve of calculated versus observed activities. All samples must be prepared and measured uniformly, however, to give satisfactory comparative results.

Some of the difficulties peculiar to window G-M tubes are obviated by the use of G-M tubes filled with the sample itself or by the use of ionization chambers, but other shortcomings in the generally available instruments tend to negate the advantages as far as precision is concerned. As stated before, a complete discussion of the problems of radioactivity measurements cannot be presented here and the interested reader is referred to the current literature and to specialists in instrumentation.

Another technique of measurement, previously mentioned, is the production of radioautographs. This procedure utilizes the radiations emitted from the radioisotopes upon a photographic emulsion. Good definition is obtained by the use of thin sections of the material being examined in conjunction with a fast, fine grained photographic emulsion. In this way the distribution of labeled substances in plants and animals has been studied, particularly the movement of nutrients inside plants. Deterioration studies of paint films and subfilm corrosion could easily use this technique.

Before the discovery of the long lived carbon-14, the only radioactive isotope of carbon suitable for tracer studies was the 20.5 minute carbon-11. Even with this rapidly decaying isotope, organic chemists were able to prepare a number of compounds with the active carbon atoms in precisely defined position. The availability of carbon-14 has changed

the situation and although it is still necessary to work with very small quantities, the time factor is no longer important. At present several labeled organic compounds can be purchased by properly authorized laboratories. To indicate the type of procedure adopted in the preparation of organic compounds, a few simple examples of synthesis will be outlined shortly.

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Synthesis

For several reasons special consideration is required for the synthesis of isotopic compounds. In much of the work in which an isotope is used as a tracer it is necessary to introduce the tracer element into a particular compound to be studied. Sometimes all that is being determined is either the path or the distribution of a particular element or a compound in a process. However, more often than not the object of the study is to determine the fate of different portions of a given compound: it is then essential that the tracer atom be inserted in a definite position, thus labeling that part of the molecule. The preparation of labeled compounds has become an important aspect of tracer studies, and considerable ingenuity has been required to devise methods of introducing an isotopic atom at a particular point.

Handling

Because of radiation hazards it is customary to work with extremely minute quantities in a closed, gas tight system. If the element has a short half life, the difficulties are increased. A technique in isotope synthesis that is coming into great favor is the use of a high vacuum manifold. In general, it involves the use of a long wide tube connected at one end to a mercury diffusion pump, with several side tubes to which reaction and storage vessels and manometers are attached by standard taper joints. Gases are transferred by displacing with mercury or cooling the receiving vessel with liquid nitrogen. Liquids are transferred by vacuum distillation or sublimation after freezing. The advantages of this technique are that very small quantities can be handled quickly and without loss, dangerous radioactive isotopes are kept enclosed until the end of the reaction, and unstable compounds are safely distilled at the low pressures used.

Oftentimes, unfamiliar reactions are used because isotopes are available only as simple compounds. Frequently the high cost of the isotope starting compounds eliminates "standard" procedures because of the relatively poor yields. Reactions calling for an excess of isotopic compounds may not be used either because of expense, danger or limited availability. Only reactions having known mechanisms may be used

since the desired product must be labeled at definite positions. Finally, to facilitate the "counting," the reactions should lead to the maximum possible isotope concentration.

Reaction with Carbon-14

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Consider the familiar compound acetic acid, CH3COOH; it can be "tagged" with carbon-14 in three isotopic forms, one with carbon-14 labeling the methyl carbon atom, another with the carboxyl carbon labeled and a third with molecules in which both carbon atoms have been tagged with the radioisotope. The action of acid on barium carbonate containing carbon-14 yields carbon dioxide; this can be reduced catalytically to methanol, by means of hydrogen under pressure at a high temperature. Upon treating with phosphorus and iodine, methyl iodide is formed, which can be converted into acetonitrile by ordinary sodium cyanide containing no radiocarbon; hydrolysis of the acetonitrile then produces acetic acid in which the methyl carbon is labeled. Thus

the	syntheses	just	discussed.	(See
	le I).			
			of labeled s	
cyar	nide will cos	t \$250); extrapolat	ing to
4	am the soul	woul	ld be \$5,000.	The

Analytical Procedures

importance of technique cannot be over-

Activity in Millicuries Compound Formula Per Millimoles Price Per Millicurie NaC¹⁴N \$250 sodium cyanide 1.0 BaC₂14 barium carbide 2.0 \$150 C214H2 2.0 \$350 acetylene CI4H₃OH 1.0 \$250 methanol C¹⁴H₃I Na₂C¹⁴O₃ methyl iodide \$285 1.0 1.0 sodium carbonate \$150 Table I

There are three special analytical procedures that are uniquely associated with radioisotopes. The first method is known as tracer analysis. This involves

fied and asseyed. The new lower specific activity, S, is equal to A/a + x. Solving for x, $x = aS^{\circ} - aS$. The pro-

specific activity, So, is A/a. After mix

ture, the pure sample is isolated, puri

cedure differs from tracer analysis in that it does not necessitate an initial chemical (or other) analysis for the element under consideration.

In many cases it is possible to start with a mixture that contains as the unknown a substance that is already isotopically labeled. The analyst can then add a known amount of unlabeled compound, isolate the substance and determine its isotope concentration. This technique is called inverse dilution analysis. Two distinct advantages can be obtained by this inversion. For one thing, very small amounts of concentrations can be determined and secondly, the pure diluting compound that is added need not be labeled.

The third method of isotope analysis is called activation analysis. It has been used to a limited extent, but it offers attractive possibilities for further application. A specimen containing a very small quantity of an element which may be difficult to determine is exposed to deuterons in a cyclotron or preferably neutrons in a nuclear reactor. One or more of the stable isotopes of the elements are thus "activated," that is, they are converted into radioisotopes which can then be detected by their characteristic radiations and half lives. By use of a comparison sample containing a known proportion of the given elements, and treating it in the same way. it is even possible to make the analysis quantitative.

An example of activation analysis is described in a paper by F. P. Bowden and A. C. Moore entitled "Physical and Chemical Adsorption of Long Chain Compounds on Radioactive Metals" published in Transactions of The Faraday Society, 47, 900-908, (1951). Experiments using radioactive metal foils have shown that the adsorption of a long chain fatty acid, alcohol or ester on platinum and gold is physical. On zinc, cadmium or copper the adsorption may be followed by chemical reaction. This occurs readily with stearic acid and to a

$BaCO_3 \rightarrow CO_2 \rightarrow CH_3OH \rightarrow CH_3I \rightarrow CH_3CN \rightarrow CH_3COOH$

emphasized!

The action of potassium on a mixture of carbon dioxide and ammonia at 500°C yields potassium cyanide; reaction with methyl iodide then gives acetonitrile, which can be converted into acetic acid, as shown above. This series of processes may be used to prepare acetic acid with the C¹⁴ in the carboxyl group, thus

If the labeled potassium cyanide is made to interact with labeled methyl iodide, the resulting acetonitrile has carbon-14 in both carbon positions.

CHI- CHICN-CHICOOH

Considerable use has been made of syntheses with the Grignard reagent, that is, alkyl or aryl magnesium halide. RMgX, where R is an alkyl or aryl group and X is a halogen. Reaction with isotopic carbon dioxide, followed by hydrolysis, yields a carboxylic acid containing labeled carbon in the carboxyl group, thus

CHSM9Br + CO2 -> CH3COOH

By heating barium carbonate with magnesium, barium carbide is formed, and this with water produces acetylene. If the original carbonate contained carbon-14, then both carbon atoms in the acetylene will be labeled. The isotopic acetylene is a very useful starting material for a number of syntheses. Some prices of the above compounds may be interesting in connection with

the addition of a small known amount of a radioactive element to a system in which the total quantity of the element is known. In view of the chemical identity of the inactive and radioactive isotopes, the proportion of stable to radioactive isotopes, i.e., the specific activity, will always remain the same after allowing for natural decay. A determination of the radioactive isotope at any time by means of a particle counter will then immediately indicate the total amount of the element present in the system.

Tracer analysis is useful in the measurement of low vapor pressures and small solubilities, where ordinary analytical methods are usually inaccurate. The principle has also been used to test the effectiveness of precipitation processes, which is, in a sense, equivalent to the determination of low solubilities. This method could be used to advantage in studying solvent retention of various film formers upon various solvents or volatile plasticizers which are suitably tagged.

In isotopic dilution analysis, the second method, a compound of a particular element, for which the analysis is to be performed, is prepared containing a known fraction of the tracer isotope. A definite amount of this mixture is then added to the system under study, and the quantity of the element present in the system can then be evaluated from the decrease in concentration of the tracer isotope. The analysis for a macro amount, x, of an organic compound is accomplished by adding a known weight, a, of the labeled equivalent. The known radioactivity added is A; then the initial

lesser extent with ethyl stearate. In the latter case the reaction is probably due to the presence of fatty acid impurity, though there is some evidence that with cadmium and zinc direct reaction with the ester may occur. The metal soap formed is physically attached to the surface and in the presence of solutions of the adsorbate, a relatively thick film of soap may be formed adjacent to the metal surface; a condition of dynamic equilibrium having been set up between the adsorbed monolayer, the adjacent soap film and the adsorbate in solution. Electron diffraction studies confirm the view that chemical reaction may occur at the metal surface and the results can be correlated with the lubricating properties of the acid, alcohol and ester on various metal substrata.

In the demonstration a metal foil about 0.001 cm thick and a few square centimeters in area was irradiated with neutrons and washed with boiling benzene in a Soxhlet Extractor until no further radioactivity was washed into the flask. The foil was then immersed in a 20 ml, benzene solution of an acid. alcohol or ester for a known period of time so that adsorption could occur. The foil was then removed. If the adsorption was purely physical, no radioactivity will be removed on stripping the adsorbed monolayer from the surface. If a chemical reaction occurs some radioactive metal will be removed. Consequently the final part of the experiment is to remove the film in the extractor and concentrate the solvent to 20ml and then examine for radioactivity. Naturally the highest purity chemicals are needed. The error reported is on the order of 25%. Other than this and a few other studies of a similar nature involving irradiated surface materials, the paint industry has not utilized the methods of radioisotopes to any great extent, that is, as far as published data indicates. Undoubtedly the larger, better equipped laboratories have explored the possibilities and still others are engaged in such studies.

Use in Process Control

In process control, various applications have been made of radioisotopes in which the radiative rather than the chemical properties of the material are used. One example is a gauge which can be used in checking the thickness of paper, cellophane, plastic or other sheet material without actual contact. A source of beta rays is placed below the sheet and an ionization chamber or a G-M counter above it. The proportion of the radiation absorbed and, hence, the number of particles reaching the counter depend on the thickness of the material through which the rays pass. A device of this kind can be used to give a continuous record and can even be adapted to automatic control.

A somewhat similar principle has been employed in a means for indicating the level of a liquid in a closed vessel. If a gamma ray source is placed at the side of the vessel, the radiation proceeding in a horizontal direction will traverse the liquid if its level is above the position of the source; on the other hand, the rays will pass through air or vapor if the liquid level is below the source of radiation. Consequently, if the latter is moved vertically, the proportion of gamma rays transmitted, as indicated by a G-M counter at the same height on the opposite side of the vessel, will change abruptly at the level of the liquid surface

Some readers will find the material presented completely new; others may find it pathetically oversimplified. The avowed purpose of this discussion was to introduce the methods of radioactive isotopes to research workers in the paint

industry. Before doing so it was absolutely necessary that all the readers be familiar with at least the bare essentials of radiochemistry. The interested reader is referred to the *Sourcebook on Atomic Energy* by Samuel Glasstone. This book is a technical but readable narrative describing the important facts of the history, status and future of the atomic sciences.

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I should like to be able to cite a whole series of references pertaining to paint developments solved by radioisotopes, but alas, there is very little to report, other than that already mentioned herein. If a substantial number of readers are interested, a more detailed listing of completed work could be compiled, or even better, the isotope approach to some of the unsolved problems in paint technology could be discussed in some future forum.



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	Color Gardner	Softening Point, °F	lodine Number	Acid Number	
PANAREZ 3-210	9	200-220	230	0-1	
PANAREZ 6-210	11	200-220	170	0-1	
PANAREZ 12-210	16	200-220	60	0-1	

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(From Page 21)

ness and purity of the several lacquer films, which may be appreciated by reference to Figure 9. Coconut alkyds A, B, C, and D changed the least, while the soya and castor alkyds and dammar changed drastically, but the character of the change was somewhat different than in the previously described exposures. Under the mercury arc, the gain in excitation purity (yellowing) is much more significant than the loss of brightness.

Conclusions

SINCE the visual change in a lacquer film under exposure is a function of two factors, brightness and purity, and various light sources do not operate on these factors in an equivalent manner, it becomes necessary to study exposure data very critically in determining which of several resin components will have the greatest color stability under the actual conditions of use. For example, in the present investigation, coconut alkyd A had the best stability to sunlight, both in Wilmington and Florida; the castor alkyd had the best stability to the carbon arc, while coconut alkyd B was most stable under the mercury

The unusual performance of coconut alkyd D is worth mentioning. It was quite poor in both sunlight exposures, fair under the mercury arc, and good under the carbon arc. In this case, we have a resin containing exactly the same ingredients as the other coconut alkyds but in somewhat different proportions and processed under different conditions. This product is a pure alkyd to the same extent as are the others of this type. It illustrates why every coconut type alkyd suitable for white baking finishes is not necessarily the best for use in pale, color stable nitrocellulose lacquers.

Although this program is still in progress, results to date indicate that no single accelerated test procedure for evaluating the color stability of clear lacquer films, regardless of whether the light source is natural or artificial, can be used to predict accurately the results to

be obtained in all types of commercial usage. However, in the interests of expediting development work, accelerated test methods are necessary. It is hoped that the data presented in this paper may be helpful in the selection of suitable procedures and in the translation of the results into products of commercial significance.

Even though coconut type alkyds as a class have been shown by this study to be in a preferred position as compared with a number of other types of resins, the unexpectedly large differences in the performance of coconut type alkyds A, B, C, and D have pointed the way to improvements within this subclass, the use of which will result in better pale, clear, color-stable lacquers.

ANGLES AND CURVES

(From Page 60)

will also put a lot of effort into training good men. Why? Because to get a job with another company as a group leader or technical director, they will have to have demonstrated or acquired such an ability."

"Well, I've heard everything now," Jane sighed. "We can't get trained men so you're going to help get rid of the guys we got now."

"Just you wait and see," I counselled. "When the news of this gets around, we'll have people clamoring to work here. If for no other reason, simply because it gives them a start on a successful technical career."

"But what about the 'flunkies'? Won't they be bored silly?"

"No. They'll be switched back and forth between different groups so that they'll have something new to learn most of the time. At the same time, we can encourage them to get additional education. And don't forget, there is always room in the industry for capable and trained men even if they don't have the ultimate in a formal education."

"Well, well," Jane sighed, It's the millennium."



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